MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 7 NOVEMBER, 1934 Number 6

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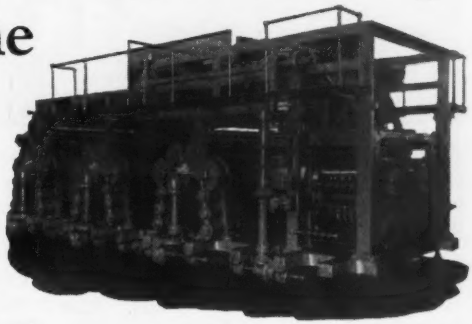
MODERN
Machine Shop

CINCINNATI, OHIO VOL. 7, No. 6

NOVEMBER, 1934

Interesting Production Operations on the Hoe Printing Press



BY HOWARD CAMPBELL

ONE of the finest examples of modern mechanical efficiency is found in the present-day printing press. Here is a machine that runs on hour after hour, feeding paper from a huge roll swiftly into a complicated mechanism from which, after it has been brought into contact at just the right instant with a stereotype or electrotype plate to which just the right amount of ink has been applied, finished newspapers, books, or magazines are delivered with amazing speed.

The modern printing press is the product of many years of evolution. In the design of this intricate mechanism is incorporated the experience of hundreds of engineers, mechanics, and users of presses. For more than one hundred years R. Hoe & Co. Inc., New York, have been building printing machinery, producing, during that time, practically every type of press from the small hand press to the mammoth "Super-Production" newspaper press that turns out, ready for the newsboy, 50,000 copies an hour. Some of the operations in the building of Hoe presses are described herewith.

The illustration Fig. 1 shows how the side frames for certain types of presses are machined. The machine is a Cincinnati-Hypro planer with a 24-foot table and 96 inches of clearance between the uprights. The job shown on the machine consists of three pairs of frames for an off-set press, but it is possible to machine 16 pairs of frames for a newspaper press at a setting on this machine. The frames are of semi-steel, and two tools are used simultaneously.

In Fig. 2 a pair of side frames for a printing press are shown set up on a Giddings & Lewis horizontal boring machine to have the bearing holes bored to size. The operator has just

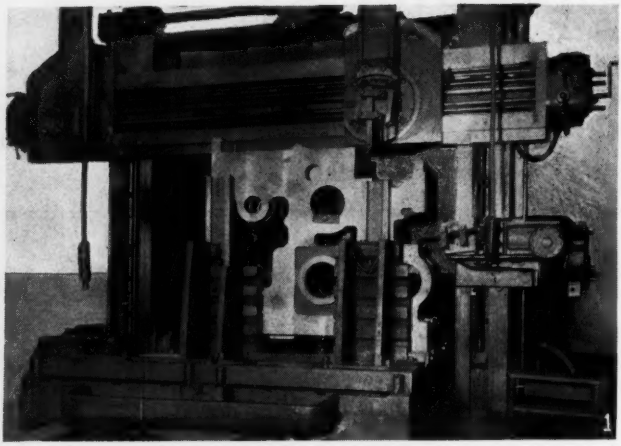


Fig. 1—Side frame for Hoe printing presses are machined in this Cincinnati Hypo Planer.

The various cylinders in a printing press appear to be of simple design, but the accuracy required in finishing these straight, round work-pieces is of the finest. On a cylinder that is 80 inches long and 7¾ inches in diameter, for instance, a limit of 0.001 inch from drawing size is allowed on the diameter and practically no variation at all—actually 0.0002 inch—is allowed between the diameters at opposite ends. This means that the cylinder cannot taper more than 0.0002 inch in 80 inches.

finished the third one of three holes, each of which is 8¾ inches in diameter. The limits on each hole are 0.0005 inches.

The machine shown in operation in Fig. 3 is of a type that is rarely seen outside of an ordnance plant. The operation is that of boring two 3¾ inch holes, each 40 inches long, in each end of an impression cylinder, and the machine is of the double-end type, equipped with gun drills. Two holes are drilled simultaneously, one in each end of the cylinder and in planes 120 degrees apart, for the reel rod. The location is taken care of by the arrangement of the drills and drill guide bushings. The second hole in each end of the workpiece is put in to balance the first one. As the material is .45 carbon steel, it can easily be seen that this is not a high speed job. The operation is completed in two passes.

Such a cylinder is the ink distributing cylinder shown in Fig. 4 in process of being ground. To insure that the cylinder will function in the press with the same accuracy that is imparted to it by the grinding machine, it is

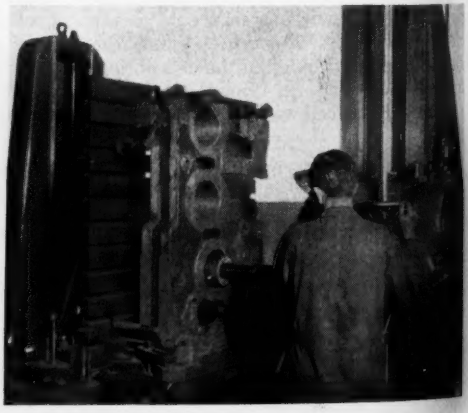


Fig. 2—Boring 8¾-inch bearing holes in a side frame. The tolerance on each hole is 0.0005 inch.

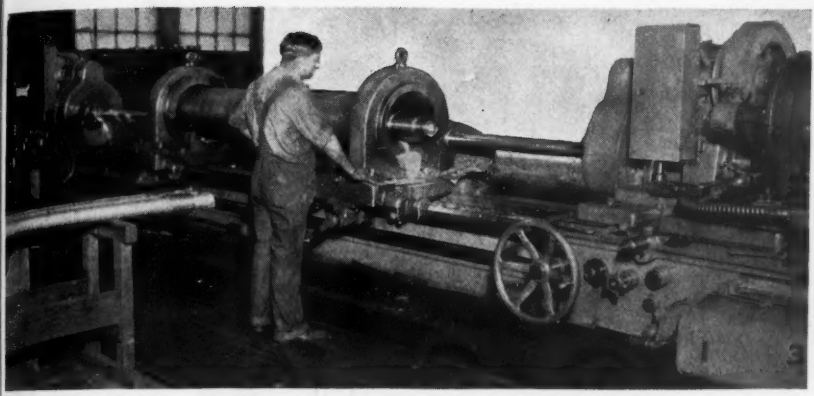


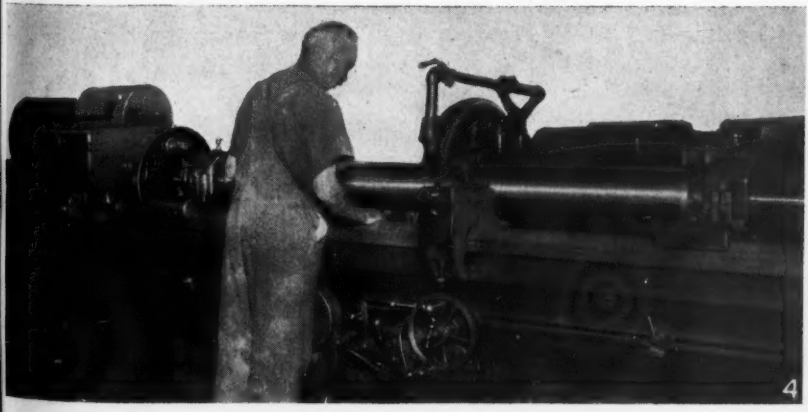
Fig. 3—Two holes, each 3¾ inches in diameter and 40 inches long, are bored simultaneously in the ends of the impression cylinder. The machine is a double-end gun drill.

ground on its own journals, for which special bearings have been made to fit the grinding machine. The cylinder comes to the grinding operation with from 0.020 to 0.025 inch of stock to be removed. The machine is a Norton 20-inch cylindrical grinder.

The illustration Fig. 5 is an end view of a special machine, designed and built by R. Hoe & Co., Inc., to machine the clip grooves in plate cylinders. The plate cylinder is a solid steel roll in diameter and 86 inches long, and each clip groove is in the form of a T-slot with the outer edges of the slot beveled. There are four slots in the surface of each half of the cylinder, extending from the end to a point somewhere near the center of the piece.

The machine is made with four spindles—two on each side—all of which operate in unison. Each spindle carries a set of three cutters, a plain milling cutter to mill the slot, a side milling cutter to mill the "T" at the

Fig. 4—Cylinders are ground in this Norton 20-inch cylindrical grinder. The diameter is held to within 0.0001 inch and the taper in 80 inches must not be over 0.0001 inch.



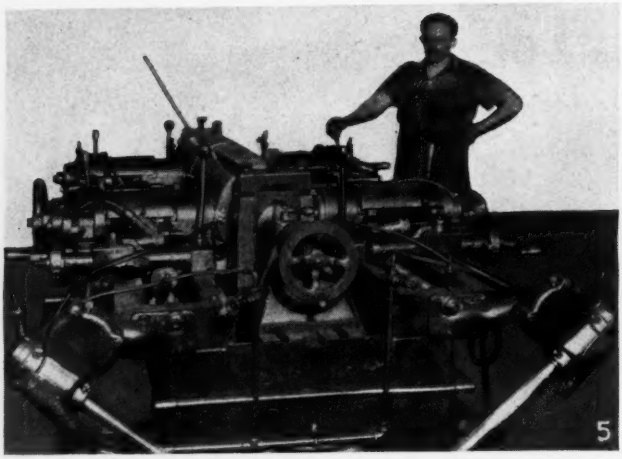
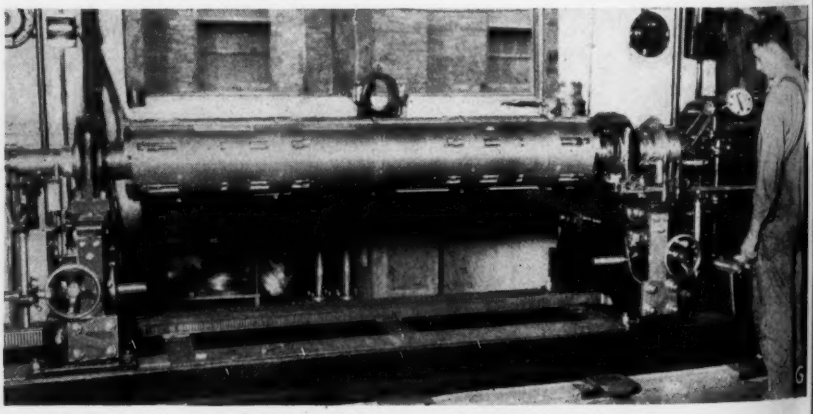


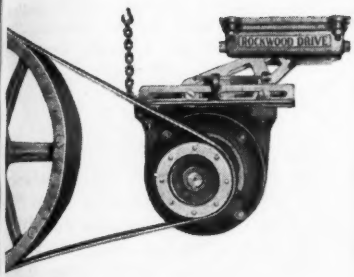
Fig. 5 — This machine mills four T-slots in a cylinder simultaneously. All dimensions are held to 0.001 inch.

bottom of the slot, and a bevel cutter to bevel the edges of the slot. One of the arbors, with its three cutters, can be seen lying on the machine. With the cylinder in place in the machine, resting on its own bearings in special journal boxes and held in position by lathe centers of the usual type, the spindles are positioned at the ends of the work-piece and the operation is started. The cutters feed from the ends toward the middle, and as soon as the cut is finished, they automatically feed back to the ends again. The piece is then indexed and the operation is repeated. The slot is 1¼ inch wide and the "T" is 1½ inch wide. The height and width of each slot are held to a limit of 0.001 inch, as determined by a Go-and-No-Go gage.

The plate cylinder referred to in the preceding paragraph is one of the many cylinders of various kinds that are incorporated in the mechanism of a newspaper press, and as such a press must operate at high speeds for long periods of time, the cylinders must be in perfect balance, both statically and dynamically, so as to avoid the possibility of vibration. Accordingly, each cylinder is balanced in a modern

Fig. 6—Each cylinder must pass rigid tests for static and dynamic balance. This balancing machine indicates both the location and the amount of unbalance, however slight.





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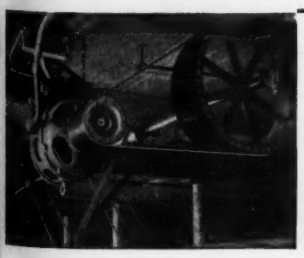

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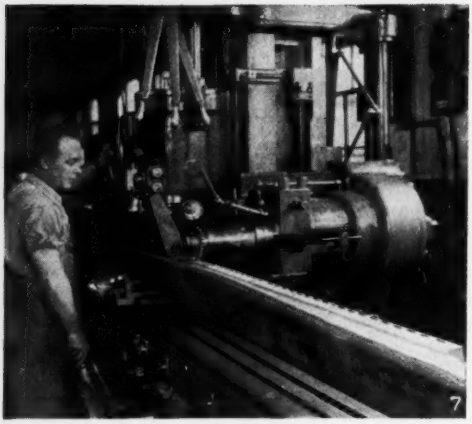


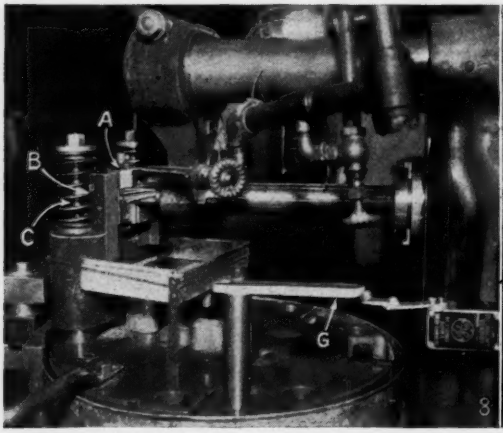
Fig. 7—Using an Ingersoll keyseating machine to mill the ink reservoirs in the ink rail for a large newspaper press.

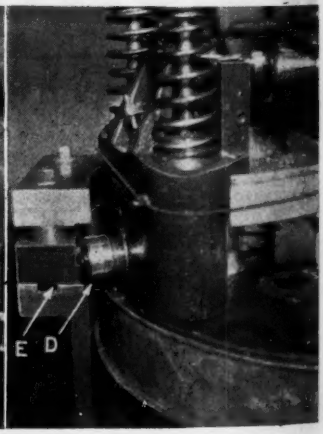
type balancing machine, as illustrated in Fig. 6.

The cylinder shown in the balancing machine is of steel, practically solid, and weighs approximately two tons. Operating in the press at a rate of 500 r. p. m., a very slight amount of unbalance would be enough to set up an unhealthy vibration throughout the machine. After being positioned in the balancing machine, the cylinder is speeded up to some 800 r. p. m. and the condition of balance noted on the indicators. The balance is tested at all speeds from 800 r.p.m. down, and if the condition of the cylinder is such as to throw it out more than 0.002 inch in 180 degrees, the unbalance is rectified.

Figure 7 shows an Ingersoll keyseating machine being used for an unusually interesting operation—that of milling ink reservoirs in the ink rail for a large newspaper press. In this operation 36 pockets ½-inch wide by 1⅞ inch long are milled to a depth of 3/16 inch, the operation being performed with the aid of a 5-inch diameter cutter as shown. Although not intended for such work, the machine is ideal for this operation. The fixture used on this job consists only of supports into which the work-piece may be clamped in the correct position.

Fig. 8—A cam-groove that is curved in both horizontal and vertical planes is milled with this equipment. Fig. 9—Rear of the fixture shown in Fig. 8. The fixture moves vertically as the roller follows the groove in the master cam.





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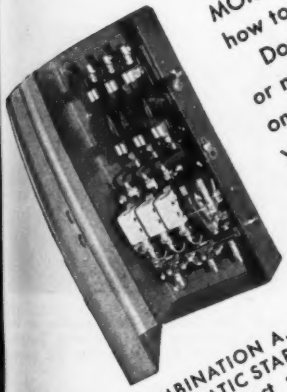

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It would seem that an indexing fixture should be used, but as there are never more than one or two pieces of a size going through on this operation, nothing would be gained. The operator on this job is an expert, and he can mark off a piece after it has been clamped in position and then machine it in much less time than it would take to place the fixture in position, clamp it, and remove it again. As can be seen by reference to the illustration, the spindle mechanism is of heavy construction, reducing deflection under pressure of the cut to the minimum. And the design of the machine is such that the spindle can be raised, the table moved, and the spindle lowered into position again almost instantly.

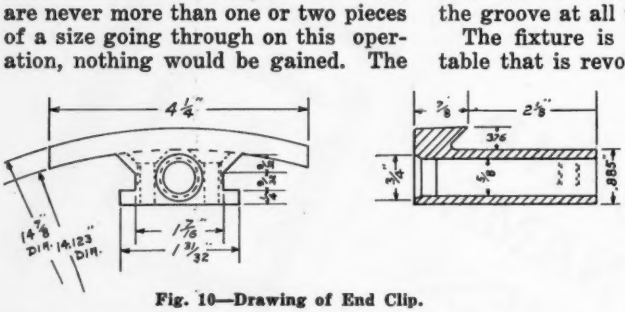

Fig. 10—Drawing of End Clip.

The illustrations Figs. 8 and 9 show the operation of milling the cam path in the cam that controls the locking of the plate on the type cylinders on a newspaper press. The machine is a Milwaukee miller, equipped with an arbor into the end of which is inserted an end milling cutter of the left-hand spiral type.

The work-piece, indicated at A in Fig. 8, is clamped in position on the body B of a fixture which is so made that it slides vertically on the two guide-posts C. To the rear of the fixture B is attached a cam roller, shown at D in Fig. 9, and attached to the machine is a steel block E in which a cam groove of the correct width and contour has been milled. Springs on the guide-posts hold the body of the fixture down so that the roller will maintain contact with the bottom of the groove at all times.

The fixture is located on a rotary table that is revolved by power when the fixture is loaded and ready for operation. The cam roller enters the groove at the same instant that the cutter engages the work; thus as the roller follows the curve in the groove, the contour of the groove is duplicated by the cutter in the work-piece.

A switch attached to the side of the machine is connected to the table by a jointed piece G, the piece being set so that, as the end of the cut is reached, a contact is made which rings a bell and thus notifies the operator that the cut is finished. The use of this signal makes it possible for the operator to operate more than one machine and still maintain full production on this job.

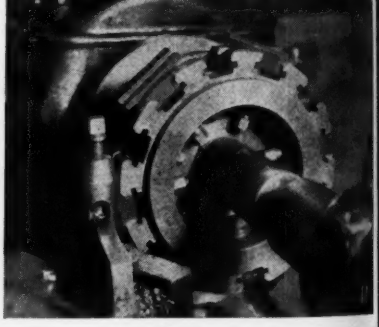

Fig. 11—Tools for turning the radius on the End Clip. The machine is a Monarch Tinker-Head Lathe, and the fixture holds six pieces.

Figure 10 is a drawing of an end clip, for the machining of which the equipment shown in Fig. 11 is used.

As shown, the piece is finished on a 1⅛ inch radius. A Monarch Timken-Head lathe is used for the job, equipped with a fixture in which six pieces are finished at a cut.

The drawing shows that the piece is 4¼ inches long by 3 inches wide. It has been found that the most economical way to obtain the stock for this part is to buy it in bars of 4¼ inch width and cut the pieces to the 3-inch dimension. The pieces are then milled to fit the standard cylinder clip groove, after which they are clamped in the fixture shown in Fig. 11 and the faces are turned to the radius specified.

In the Hoe plant the traditional method of building printing presses by clamping brackets and other parts together, locating them in position and then drilling and bolting the parts in place has been completely discarded. As can be seen from the foregoing, the operations have been standardized and jigs, fixtures, and other tools for the production of interchangeable parts are now used wherever possible. An article which will be published in a later issue of this magazine will describe the production system, by which a continuous succession of small orders for a vast variety of machines and parts—comprising practically a large jobbing business—are handled on a production basis.

THE DESIGN OF JIGS AND FIXTURES

This interesting booklet, published by The Linde Air Products Co., 30 East 42nd St., New York, N. Y., consolidates and crystallizes current ideas on how to design jigs and fixtures for welding, whether it be production fabrication or repair work. The importance of proper design of jigs can hardly be overemphasized. It is a consideration which bears directly on the production cost of a welded article. Labor, time and handling charges, in an operation that has to be repeated in the manufacture or repair of similar articles, can be substantially reduced by properly designed work-holding devices. And this booklet tells what considerations must be taken into account in order to realize to the maximum such benefits.

The four definite advantages derived from the use of fixtures and jigs—convenience to the operator, a reduction of the cost of the articles, standardization of articles, and accuracy in fabrication—are discussed in their relation to the economies of production. The fundamentals of design are given and their influence on cost reduction discussed. Clamping devices are described, with suggestions on how they are made. The whys and wherefores of locating points are considered.

The booklet is plentifully illustrated with photographs and sketches showing every point, and many useful ideas can be gleaned from the pictures alone. Copies gratis.

NEW 1934 BONNEY WRENCH AND TOOL CATALOG. Bonney Forge and Tool Works, Allentown, Pa., has issued its 1934 Wrench and Tool Catalog. This catalog, No. 34, describes and illustrates Bonney's complete line of wrenches, as well as its lines of screw drivers, chisels, punches, hammers and similar tools. It also shows all the wrenches and wrench sets added during the past year.

The catalog is attractively arranged, and is printed on light-weight stock. A ready reference system is used and net prices, as usual, are shown throughout. Much data which is generally useful to jobbers' salesmen and mechanics is given throughout the catalog. Copies will gladly be supplied to mechanics and jobbers who are interested.

"WHAT'S A GOOD STAINLESS STEEL SUPPOSED TO DO?" Under this title The American Rolling Mills, Middletown, Ohio, has issued a folder explaining and illustrating the outstanding features of stainless steel and suggesting the advantages that may be obtained through the use of stainless steels for a variety of operations and products.

The folder contains a paragraph of comment upon the performance of stainless steel for picking, punching or shearing, gas or electric welding, riveting, spinning, and soldering, also upon the matters of corrosion, heat resistance, and versatility of the metal. Copies gratis.

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Operation: Cutting splines on final drive shaft.
Machine: Lees Bradner 5 AC Hobber
Material: SAE 3145
Feed: .050 inch
Speed: 80 feet per minute
Lubricant: 1 part Sunoco to 10 parts water

Courtesy of
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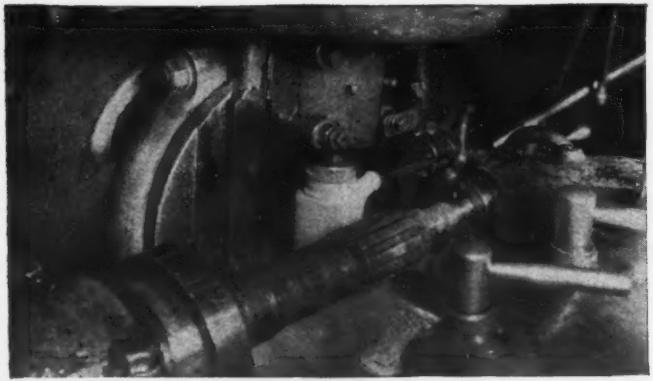

Operation: Finish grinding lower bearing and shoulders on track wheel shaft
Machine: Norton Grinder
Material: SAE 1035
Stock Removed: .025 inch (.010 inch on shoulder)
Wheel: 24 in. diam., 5½ in. wide
Wheel Speed: 1050 r. p. m.
Surface Speed: 68 ft. per min.
Coolant: 1 part Sunoco to 40 parts water.

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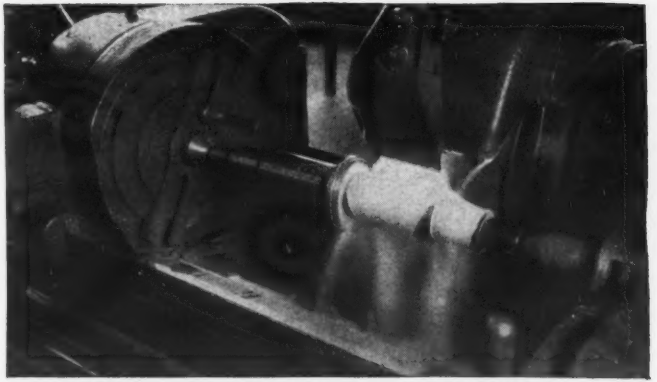

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Punch Press Operations and Tools, II

In this, the second article of the series, the construction and application of piercing and parting dies is discussed.

By C. L. Szalanczy

THE piercing and parting die may be termed a progressive type of die, since it is really two separate dies set into a single shoe. Each die performs its individual, single operation at its own particular station, but both

Fig. 1—Showing straight ends on blank made by cut off die.

operations are performed at one stroke of the punch press ram.

This type of die can be used only when the blank material is either standard "scrap" stock or material that has been sheared to width. The parting type of die may be used efficiently on light material, but the real advantage is obtained when it is used on heavier materials.

The action of the pierce and cut-off die was explained in detail in the first article of the series, published in the October issue of MODERN MACHINE SHOP. The article told how a straight cut is made along and against the cutting side of the die, with no scrap resulting from the cut. The blank, however, is left with a certain amount of distortion along the cut surface. When a parting die is used, there is no distortion, but a certain amount of scrap is produced. The reason for this is that the parting die produces a stamping by punching out a short section of the material in severing each successive blank from the scrap stock.

The width of the scrap, or punched-out section, is determined by the thickness of the stock that is being punched, the usual allowance being one and one-half times the thickness of the material. Thus if ⅛-inch scrap is being used to produce the blank, the parting punch would be made 3/16 inch wide through the cutting section and the corresponding scrap would naturally be the same.

This ratio of scrap will automatically tend to increase the piece cost of the blank over the cost of a sim-

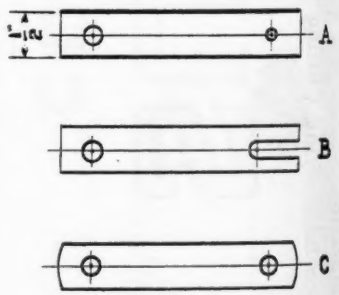

Fig. 2—Types of blanks that can be produced from strap stock by using a piercing and parting die.

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ilar blank as produced by a pierce and cut off die. The difference between the two types of dies consists in that, when the cut off die is used, the ends of the blank must be cut straight as shown in Fig. 1. By using a parting die that cuts on both sides across the entire width of the scrap, a variety of blanks may be produced. Several different kinds of blanks made by a parting die are shown in Fig. 2.

The piercing operation always precedes the parting operation, although both operations are performed in the same die block. Either a single hole

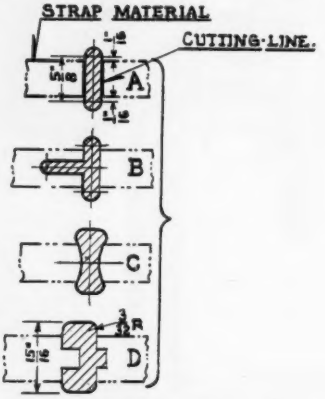

Fig. 3—Sections of the parting punches required to produce the blanks shown in Fig. 2.

or a series of holes, of any shape, may be punched in the blank.

When starting a strip of material through the die, the operator should push the strip through the stripper slot so that it just passes the parting punch. When the ram, carrying the punch or upper part of the die, comes down, it pierces the holes and cuts off the end. The end now being finished according to the drawing, the stock can be pushed against the stop in the stripper and for each stroke of the press a completed blank will be produced.

The parting operation completes both ends of the blank, since the punch is made to suit the contour or form of both ends of the blank. The parting punches for the blanks shown in

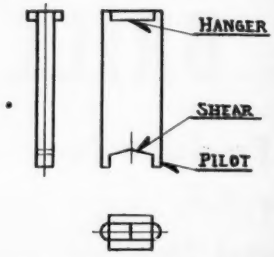

Fig. 4—Drawing of parting punch, showing hanger.

Fig. 2 are illustrated in Fig. 3. It will be seen that they are longer over the cutting surface, and are provided with a pilot on each end. These extended pilots are made long enough to come down over and past the blank material, so that they can guide the punch into the die. Thus, being already entered into the die before the cutting action begins, all hazard of the punch being out of line with the die and thereby causing damage to either the die or the punch is eliminated.

The parting punch is ground to produce a shearing effect, tapering toward

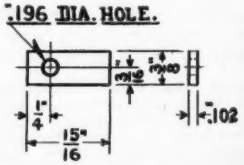

Fig. 5—Simple type of blank produced by a piercing and parting die.

the center. This is done to facilitate cutting through the heavier materials.

When punching light materials up to 1/16 inch in thickness, the punch may be held in the punch plate by

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peening the upper end over slightly, but when the material is more than 1/16 inch thick, it is better to provide hangers or side supports to prevent any "pulling out" action on the part of the punch during the stripping operation. These hangers are shown in Fig. 4.

A blank of simple design is illustrated in Fig. 5. The specifications call for these blanks to be made from standard rolled copper bar, 0.102 inch in thickness and ⅜ inch wide. To produce these blanks, a piercing and parting die is to be constructed according to the drawing shown as Fig. 6.

The die set, A, can be made by the die maker, but it will probably be purchased for reasons explained in the previous article of this series. The size of die set required is determined by the size of the die block and the punch holder plate. The punch plate B is made of machine steel, ground on top and bottom, and is laid out and machined to hold the punches in their respective positions. The punch plate is held to the top shoe by filister head screws and dowel pins. The punch plate should be not less than ⅝ inch thick, so as to afford side support for the punches.

The stripper C is made from ⅝ inch thick machine steel, and is case hardened to resist wear. The stripper is finished to a close slip fit for the punches. To the right end of the stripper is attached the finger guard D, through which the material to be blanked is fed into the stripper groove. This groove is machined in the same manner as the groove in the piercing and cutting off die, and is provided with the stripper bar F with its spring assembly as described in the previous article of the series.

It is sometimes necessary to make the stripper longer than the die, so that there will be more guiding surface for the blank material. When this is done, a piece of 1/16-inch thick sheet iron is attached to the bottom of that part of the stripper which extends past the end of the die. This plate, indicated as G in the drawing, is usually called an apron. It is used to support the material and prevent it from sagging down out of the stripper groove.

A section is cut out of the apron, extending from the front of the stripper back past the material groove in which the lift latch or material stop H operates. The lift latch is of hardened tool steel, and is used to gauge the length of the blank before the parting operation takes place. The latch hinges on a section of ⅛-inch stub steel I, and is fitted with a handle J, which is made from ¼-inch stub steel. This handle answers two purposes: first, it is used to stop the latch from falling down past its predetermined position in the stripper, and second, it is used to lift the latch upward, making the removal of the finished blank easier. This will be found an advantage because sometimes the blank does stick between the stop and the punch.

The die K is made from the high speed steel that is especially produced for the making of cutting tools. It is machined to suit the requirements of the blank, and is then filed to exact dimensions to suit the punches. Clearance of from ¼ degree to ½ degree taper is usually provided on the die so that the scrap will fall through easily. This taper extends from the bottom of the die to within ⅛ inch of the top. The usual clearances are allowed between the punches and the die.

Examination of the illustration will show a taper in the die, which is provided to allow the blank to clear the die easily as it is punched from the stock. The blank drops onto a removable chute that is made from 1/16-inch sheet iron, bent to form an

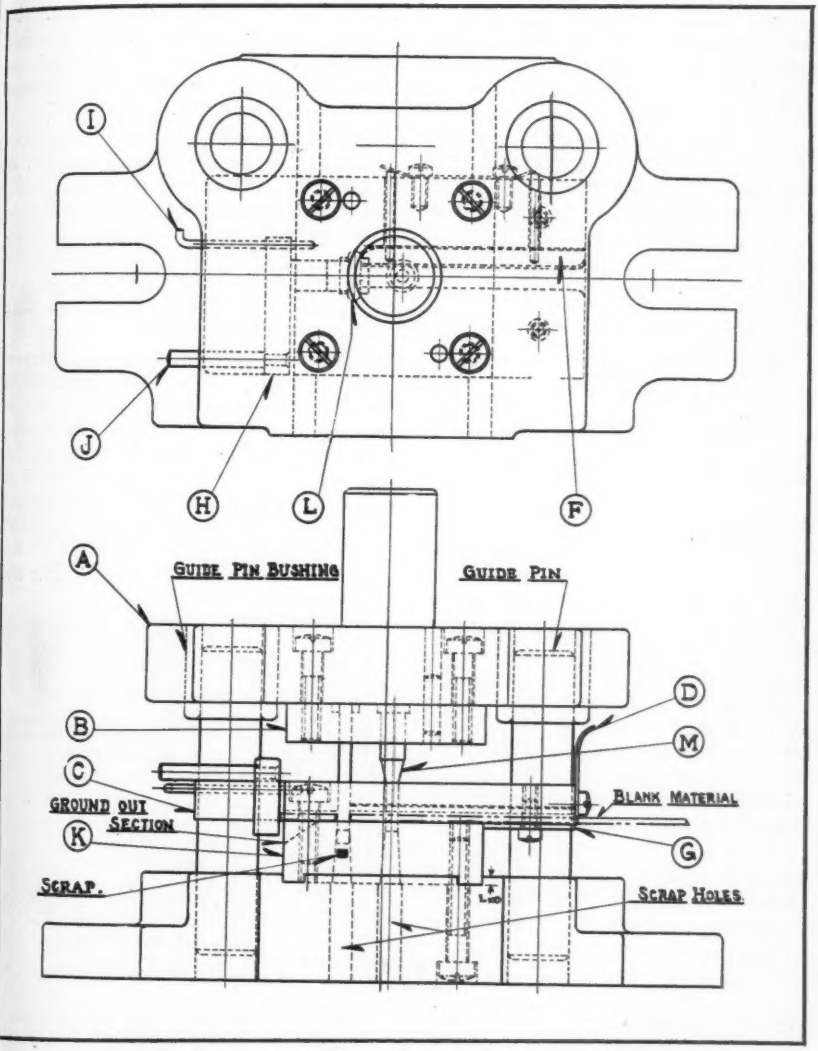


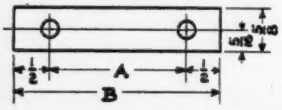
Fig. 6—Assembly drawing of piercing and parting die.

L shape. One end of the chute rests on the die shoe while the other end rests on the press bed. While this chute is not generally standard equipment on dies, it aids the operator because it practically eliminates the piling up of the blanks directly beneath the latch.

The die is hardened to 80 to 90 on the Scleroscope scale, and is then

ground on top and bottom. The die may be located on the die shoe by setting it down into the shoe, or it may be set directly on the shoe and held in position by the use of dowel pins. The latter method is the cheaper because it does away with the extra machining.

The parting punch, which is made



ITEM	MATERIAL.	A.	B.
1	1/8 x 5/8 Brass Strap.	1	2
2	" " "	2	3
3	" " "	2½	3½

Fig. 7—A tabulation of three different blanks that are to be produced by the die illustrated in Fig. 6.

from high speed steel, is shown at L. After being shaped up to nearly the correct size, the punch is hardened to the same hardness as the die and then it is ground to size as specified. The upper end of the punch is left soft to absorb the shock produced by the cutting action of the die on the material.

The shoulder punch M is of tool steel, shaped up on a lathe. After being hardened, it is ground to size. In the larger manufacturing plants where these small round punches are used in large quantities, they are carried in stock in the store-room, the usual sizes ranging from 5/64 inch to 5/16 inch diameters in steps of 1/64 inch. Thus a number of punches of the same size may be made up and hardened at the same time, afterward being placed in stock to be drawn as required. When a small punch of an odd size is required, the next larger size is drawn and ground to the required size.

It can readily be seen that this method will reduce the piece cost of punches. At the same time, it tends to aid in standardizing the tool room accessories, so that when a tool designer is specifying the sizes of the punches on a tool drawing, he will not call for larger diameters than are actually necessary.

In cases where there are several blanks to be made that are alike so far as the ends and the location of the holes from the ends are concerned, they may all be made in the same die if the stripper has been planned so that a sliding gauge is used instead of a stationary one. Fig. 7 shows a tabulation of three blanks that are to be made in the same piercing and parting die.

In order to handle these three

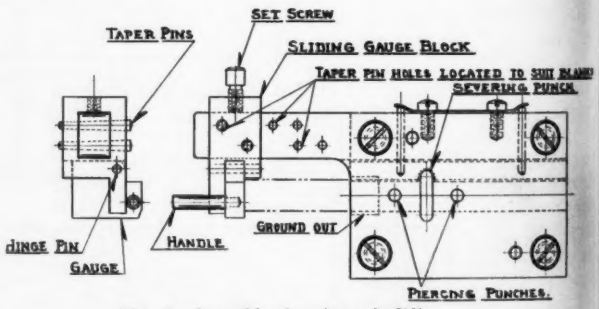


Fig. 8—Assembly drawing of sliding gauge.

blanks in the same die, the stripper is made so that it has an extended neck on which the sliding gauge assembly is located. The sliding gauge block is made from machine steel, shaped as required, and made to a slip or running fit on the stripper neck. It is fastened by means of a square-

(Continued on page 30)

"MOLY" HACK SAW BLADES

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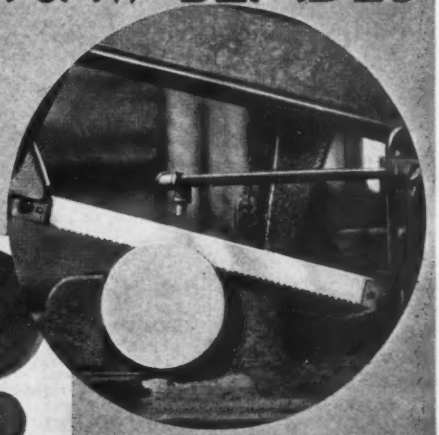

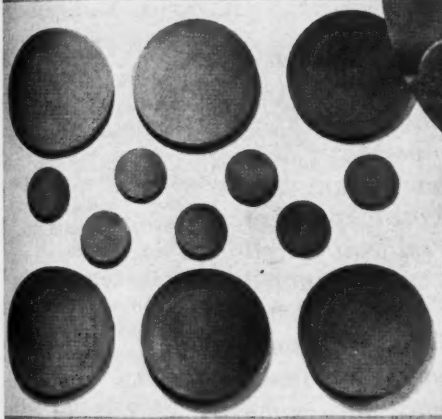

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The Effect of Heat Treatment on the Elasticity of Steel

By George Laidler

ONE of the odd misconceptions found even among experienced shopmen is that tempering affects the stiffness of steel. They fail to distinguish between strength and stiffness. Strength is the resistance to ultimate or disruptive stress, whereas stiffness is the resistance to deflection.

The following endeavors to show that these terms are not synonymous, and that the stiffness of steel is independent of tempering.

A railway company found that a certain type of built-up brake beams had not sufficient rigidity for its purpose, and a shop official conceived the idea of heating them and quenching them in water to harden and "stiffen" them. His more technical associate tried to assure him that this procedure would not make them any stiffer, and to demonstrate his assertion he made this experiment:

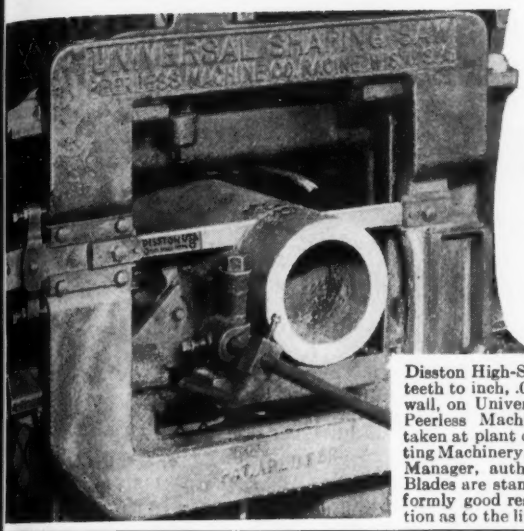
Four all-hard hacksaw blades ¾x 14x.046 in., as nearly alike as could be, were taken from a new package. Two were packed with mica in a pipe and annealed. The hard blades scleroscoped at 94 and the soft at 42 to 46. In turn all four blades were loaded as cantilevers, both ends and both sides being tested for deflection under load. It was interesting to find that the hard blades actually deflected 6.6 per cent more than the soft blades under a given load, a striking result of internal stress in a thin section.

In spite of this demonstration the official was still unconvinced, and by his orders the brake beams were hardened, but without the desired effect. The notable result was that some badly annealed malleable brake beams were shattered by the transference of an increased load.

The common idea that heat treatment will stiffen the resilient part of a mechanism is erroneous. What it does is to raise the elastic limit and ultimate strength. The member will therefore withstand a greater load than before without rupture. Its ultimate fiber stress will be increased, but its resistance to deflection will be the same as before.

To put the matter in another way: Into no calculation for deflection does the hardness of the material enter.

● *Modulus of elasticity, commonly designated as "E" in design work, is a very important value. The author's point that this value is independent of heat treatment is well taken. It might be noted that it is also independent of carbon content, and even alloy steels have about the same modulus.*



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Disston High-Speed Steel Hack Saw, 14" x 1", ten teeth to inch, .065 thick, cutting 6" steel tubing, 3/8" wall, on Universal Shaping Saw, manufactured by Peerless Machine Co., Racine, Wis. Photograph taken at plant of H. Brinton Co., Automatic Knitting Machinery, Philadelphia. John Leafstrom, Shop Manager, authorizes the statement that Disston Blades are standard and satisfactory, "giving uniformly good results, without any noticeable variation as to the life of the blade."

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A dead soft spring will have just the same ratio of load to deflection as a glass hard one, and will function the same up to the elastic limit of the material. This means that a spring or other resilient part will undergo a greater deflection before its elastic limit is reached. Since the rate per unit of deflection is unchanged, it will, therefore, carry a greater load.

Experiments were made by the Baldwin Locomotive Works to determine the effect of different heat treatments on the transverse elastic limit and the modulus of elasticity of the steels commonly used for locomotive springs. Among other things it was shown that the modulus of elasticity; that is, the relation of stress to strain, is practically constant and apparently independent of the heat treatment, averaging about 29,000,000 pounds per square inch for tensile stresses.

To make our terms clear we must remember that:

$$\text{Stress equals intensity of load} \quad \text{equals} \quad \frac{\text{total load}}{\text{area}} \quad \text{or} \quad \frac{\text{lbs.}}{\text{sq. ins.}}$$

$$\text{Strain equals} \quad \frac{\text{change of dimension}}{\text{original dimension}}$$

or $\frac{\text{inches}}{\text{inches}}$. And "within the elastic limit, stress is proportional to strain", or $\frac{\text{stress}}{\text{strain}}$ equals a constant, equals modulus of elasticity equals $\frac{\text{lbs.}}{\text{sq. ins.}}$.

In the case of coil springs the stress is that of torsion, which is a form of shear, and it has been repeatedly proved that the torsional or shear modulus of elasticity for tempered and untempered steel is constant, the value being about 11,000,000 pounds per square inch, and usually about two-fifths of the tensile modulus of elasticity.

The letter denoting the modulus of elasticity always appears in the formulas for deflection, for deflection depends upon elasticity. Since the modulus is constant, the deflection will be constant for similar conditions, whether steel be annealed or tempered.

Punch Press Operations and Tools

(*Continued from Page 26*)

head set-screw in the rear and is maintained in position by means of two taper pins. The gauge block carries the tool steel stop **H**, Fig. 6, which is operated in the same manner as the one just previously described.

The assembly of the sliding gauge is illustrated in Fig. 8. This illustration also shows the punch arrangement used when more than one blank is to be produced by the die. In such cases, the holes must be pierced on each side of the parting punch so as to maintain the set dimensions from the ends of the blanks to the centers of the holes. In this way the difference in the overall length will come between the holes.

LEWELLEN VARIABLE SPEED TRANSMISSIONS. A complete exposition of the various types and sizes of variable-speed transmissions made by Lewellen Manufacturing Company, Columbus, Ind., is contained in Catalog No. 25-C, which has been issued by this company.

The book contains 44 pages, 8½ x 11 in. in size, and the text describes in detail the latest developments in variable speed transmissions and speed controlling devices. The principles of operation, bearings, lubrication, design and construction, methods of control, and applications are discussed in detail, the text being illustrated with 129 photographs and drawings. Copies of the catalog are available to mechanical executives without charge.

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Interchangeable Mechanism for Providing Various Intermittent and Reciprocating Motions

By J. E. Fenno

IN THE testing laboratories of most electrical switch manufacturing plants, mechanical equipment is provided for subjecting sample switches to every conceivable abuse which the switch may have to withstand in actual use. The life of the switch is then judged by its condition after this abuse and the length of time it remains under test without being worn out or burned out.

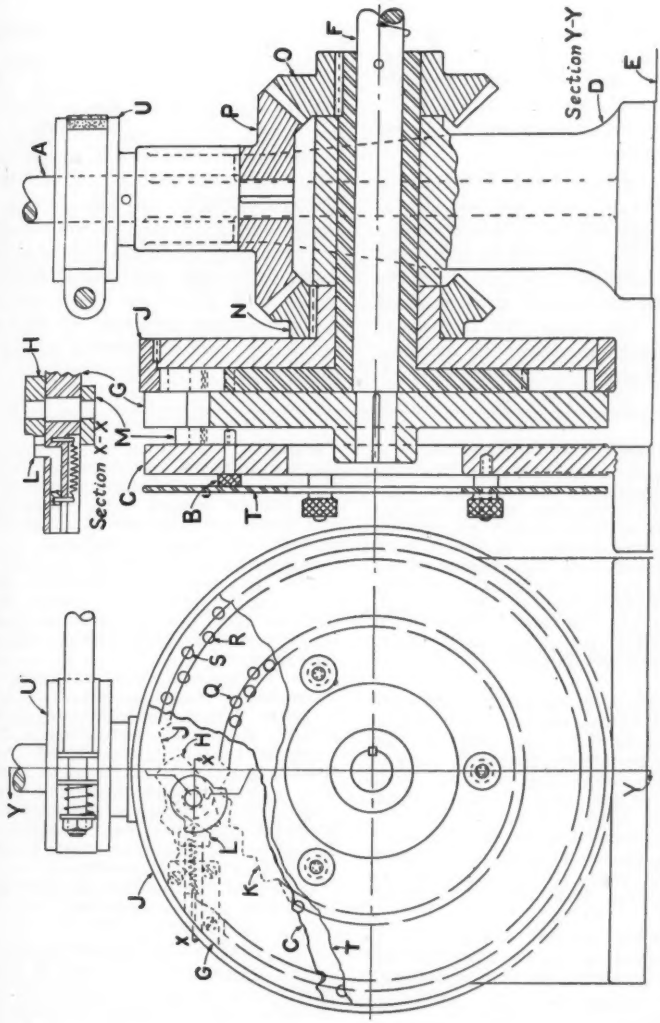
One very ingenious mechanism for producing the movements required in these tests is shown in the illustration. Practically any rotary movement of shaft A can be obtained either constant, intermittent, or reciprocating, or a combination of all of them is available by merely locating a number of trip pins B in their proper positions in the dial C.

The entire mechanism, with the exception of dial C, is mounted on bracket D, this bracket being bolted to the machine frame E. The dial C forms its own base and is also bolted to the machine frame. Drive shaft F rotates at a uniform velocity, and keyed to its left hand end is the disk G. In this disk is pivoted a pawl H which is provided with a spring actuated plunger L that engages either the teeth in ring J as shown or the teeth in disk K. The plunger will also hold the pawl in a neutral position when its point engages the vee in the back of the pawl.

The actual shifting of the pawl to these three positions is accomplished by the pins B in the stationary dial C. These pins come into contact with the segment M that is keyed to the shaft upon which the pawl is secured, and swing the latter to one of the three positions mentioned. Members J and K have keyed to their hubs the two bevel gears N and O. These gears mesh with gear P, keyed to the driven shaft A. With this arrangement, pawl H, when engaged with either the ring J or the disk K, will rotate these members in the same direction, but the corresponding movement imparted to shaft A will be in opposite directions.

In the position now occupied by pawl H, the latter is rotating the member J in a clockwise direction; hence, shaft A will rotate in the same direction. Now, let us assume that two pins B are located in dial holes Q and R. Then when the segment M comes in contact with the pin in hole Q, the pawl will be swung out of engagement with member J and into engagement with member K. The rotation of this member with the pawl will then cause the shaft to reverse its motion. As disk G with the pawl continues to rotate, the pin in hole R will swing the pawl back to its former position in engagement with member J. As a result, member J will rotate with disk J and cause shaft A to again reverse its motion.

Now suppose that instead of a reversal of shaft A, it was required that the shaft dwell after approximately one complete revolution. To obtain this effect, another pin B would be



Design of Interchangeable Mechanism for Providing Various Intermittent and Reciprocating Motions.

inserted in hole S. Thus, when member G with the pawl had made the required movement, the segment would come into contact with this pin and the latter would force the pawl around with its vee notch engaging

the point of plunger L so that one motion would be imparted to either members J or K. Consequently, shaft A would dwell momentarily until the pin in hole R forced the pawl around still farther and into engagement with member K, causing shaft A to rotate in the opposite direction to its preceding movement.

For the various tests involved, a large number of combination movements are obtained with this mechanism by locating pins B in different holes. Incidentally, if a uniform movement in one direction of shaft A is required, only one pin is needed and it is located in either the extreme outside or inside hole circles depending on the direction of rotation required in order for the shaft to function properly.

To facilitate the laboratory work, a test sheet is provided for each type of test in which a diagram of the dial is shown with the pin locations required. Since the number of teeth in the members J and K are the same, and both gear ratios are one to one, the movement can readily be determined. In inserting the pins, plate T is removed but is replaced afterward to retain the pins. A friction brake U is added on the driven shaft A to prevent overrun of this shaft resulting from the inertia of the moving parts.

SHEFFIELD GAGE MANUAL

This manual, issued by The Sheffield Machine & Tool Co., Dayton, Ohio, consists of an attractive ring binder containing 32 pages of information printed on heavy cardboard leaves. The text contains descriptions and illustrations of the most modern types of Visual Gages, Electric Gages, Adjustable Limit Plug Gages, Solid Plug Gages, Pin Gages, Thread Plug and Ring Gages, Adjustable-Limit Snap Gages, Adjustable Length Gages, and other gages.

The manual also contains a Glossary of Technical Terms as applied to gaging members, Tables of National Screw Thread Commission Standards, Standard Lists of Thread Plug and Ring Gages, Basic Dimensions of American Standard Taper Pipe Thread Gages, Table of Decimal Equivalents, Constants for Finding Pitch Diameter of Screw Threads and Thread Gages, Basic Thread Dimensions and Tap Drill Sizes and Millimeter Conversion Table.

A copy of the manual will be sent to any mechanical executive who will address his request on his firm letterhead.

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An important factor in the growth of many of our largest industries in the past quarter century has been the adoption of grinding wheels—both snagging and cut-off—which have made possible the establishment of new production standards. Within more recent years further impetus has been given to industry through the development of abrasive wheels bonded with materials that will stand the high speeds. One of these materials is Bakelite Resinoid.

These resinoid abrasive wheels have made it possible to operate grinding equipment at the high speeds of 9,500 surface feet per minute on snagging operations and 16,000 feet per minute on cut-off work.

To summarize the advances which have been made in grinding technic, Bakelite Corporation, Rive Road, Bound Brook, N. J., has published a 24-page booklet titled "High Speed Abrasive Wheels Bonded with Bakelite Resinoid." The booklet touches upon the historical phases of the abrasive industry and includes a discussion of the properties of Bakelite resinoids as they pertain to grinding wheel construction.

Copies of the booklet are free to engineers and plant executives.

AMERICAN SWISS FILES

The American Swiss File & Tool Co., 412 Trumbull St., Elizabeth, N. J., has issued a booklet listing, illustrating, and describing the complete line of files manufactured by this firm. This includes all the usual types of mechanics' files, regular die sinkers' files and riffles, silversmiths' riffles and other standard and special files made by this company. A copy of the booklet is available to any mechanical executive upon request.

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It is upon this diversified background of accumulated experience in applying Carboloy tools that your Carboloy representative bases his recommendations to you.

Rapid dissemination of performance reports from the Carboloy organization-at-large currently supplements the personal experiences of each Carboloy representative and enables him to give you at all times the latest, most economical recommendations.

Consult your Carboloy representative with confidence—whether it be for a single application or for the tooling of an entire series of operations. He is prepared to furnish cost-saving facts applied to your jobs before you spend a single penny for Carboloy tools.

A Summary of 100 Jobs

An analysis of more than 100 applications selected at random and embodying a representative cross section of machining operations, materials and industries, reveals the following interesting performance of Carboloy Tools: Average Speed Increase: Steel: 115%, Cast Iron 153%, Aluminum Alloys 238%, Brass, Bronze, Copper 297%, Non-metallic substances 175%. Average ratio of toollife between grinds, Carboloy vs. previous tools: Steel: 12:1%, Cast Iron 29:1%, Aluminum Alloys 32:1%, Brass, Bronze, Copper 36:1%, Non-metallic materials 30:1%.

These figures are not presented with the idea of setting up a standard of practice but are intended to serve as some indication of the average performance of Carboloy tools on representative applications.

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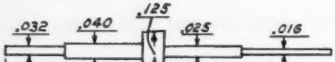
IDEAS FROM READERS

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Using Shellac as a Collet for Small Work

By Charles Kugler

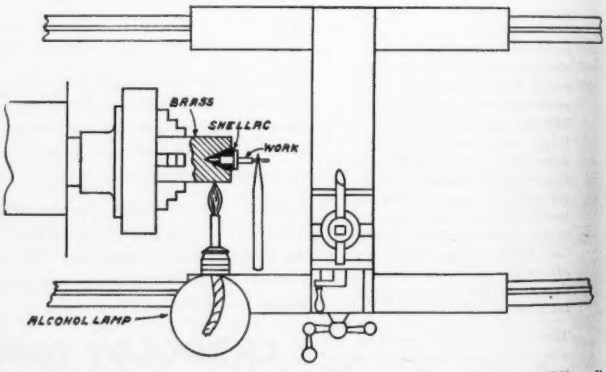
ALTHOUGH a certain amount of the finer class of tool work done today will compare with watch and clock repair work, watch repair men are acquainted with a few kinks that are still unknown to the average toolmaker. One of these is the trick of finishing small pieces in shellac where a collet for such small work is unavailable. As far back as 40 years ago I have seen shellac used to hold slender work in the grinder and have since used it myself to hold fine work in the grinder, lathe, and the shaper. So while the idea is not "new", I still think it will be new to the greater part of the present crop of mechanics.



Enlarged drawing of pivot.

To explain how shellac is used to hold work in the machine, I will describe a job that I saw done some time ago. In a small job shop where the only lathe available was an 18-inch machine with no collets it became necessary to make a lot of small pivots as indicated in the upper drawing. In the first attempt, the mechanic gripped a piece of ¼-inch drill rod in the chuck and tried to finish both pivots at one setting. This was found impossible, due to the work being so frail.

The entire lot of pieces was made, however, one end being finished and the other end being roughed out. Then a piece of brass was gripped in the chuck and a deep V center was made in it. This done, the brass piece was heated with an alcohol lamp and the center was filled with shellac. Then, with a pair of tweezers, the work was held with the finished end in the shellac while the



Drawing illustrating method of finishing small work by holding it in shellac.

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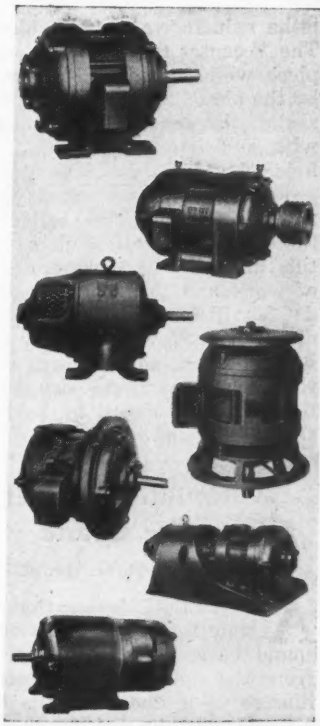


lathe spindle was run at high speed. The V center trued up one end of the piece while the other end was trued by the aid of the tweezers. When the shellac hardened, it held the work with sufficient grip so that the unfinished section could be finished.

To remove the work, it was only necessary to heat the shellac. Where there are no small collets available, this method will serve for a variety of work and the same V center will do for pieces of varying sizes and diameters. However, heavy cuts cannot be taken, so the work should be roughened nearly to size before attempting to finish it by holding it in shellac.

Automatic Gripper for the Crane

By Paul C. Bruhl

A GRIPPING device that will enable the crane operator to pick round bars, axles, and similar work from the floor without assistance is illustrated in the drawings herewith. Not only can he pick up the bars unaided, but the device will hold the work securely during transportation.

The gripper is suspended from the crane hook, as shown in the illustrations, by a cable that is attached to one end of the jaw **A**. This cable passes through the eye of the toggle **C**, which is attached to the end of the jaw **B**. The free end of the cable carries a swivel shackle for attaching to the crane hook. To the jaw **A** is also attached a line that leads to the crane operator's cab, where the free end is fastened within easy reach of the operator. By taking up the slack in this line as the gripper is lowered to the work, the jaws are opened. When the gripper is in the correct position, the line is released. As the hoisting operation begins and pull is exerted on the cable, the jaws of the gripper close about the work as shown in Fig. 2.

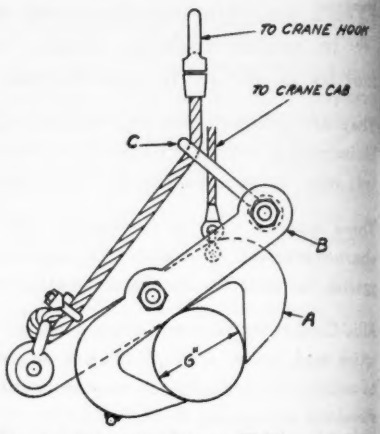


Fig. 2—Automatic Gripper Holding 6-In. Bar.

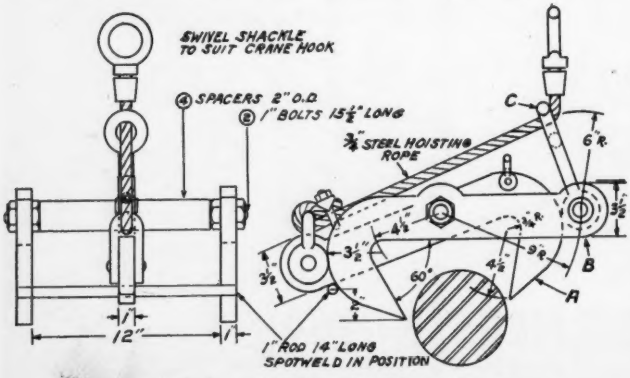
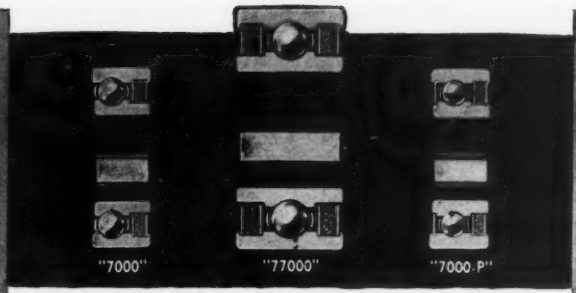


Fig. 1—Design of Automatic Gripper for Crane.

The main parts of the gripper are cut from 1-inch boiler plate by means of a cutting torch, and are held together



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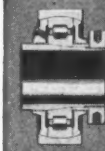

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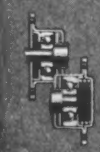

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by bolts and spacers. No machining is necessary except the drilling of the holes for the bolts and a certain amount of grinding on the contact surfaces. If made to the dimensions indicated in Fig. 1, the gripper will carry a safe load of 2,000 pounds.

Simple Dividing Plate for Extreme Accuracy

By Ted Rueb

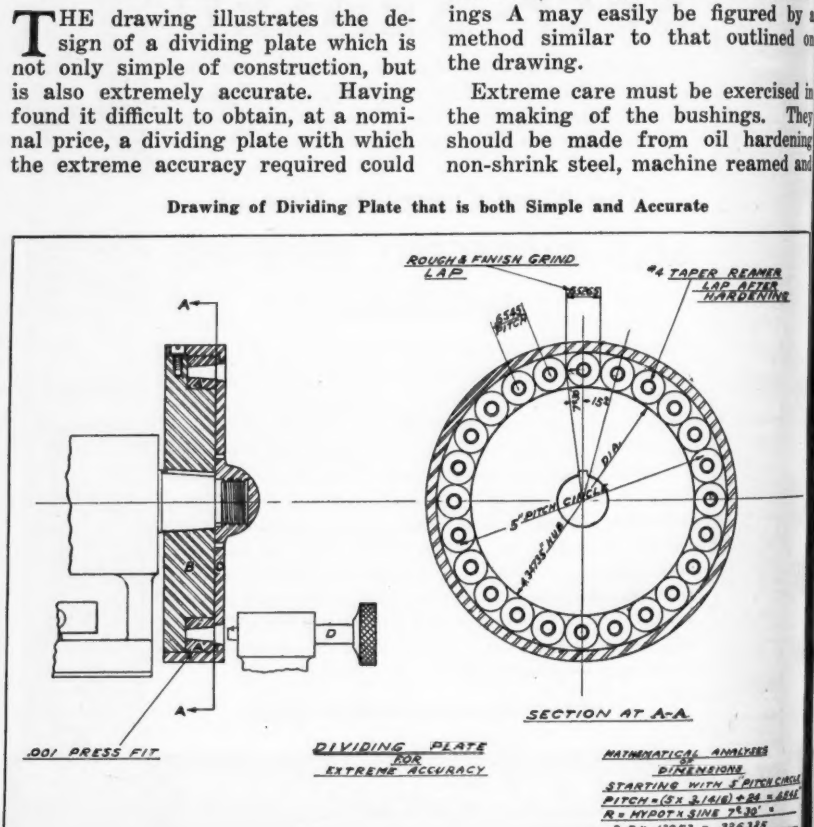
THE drawing illustrates the design of a dividing plate which is not only simple of construction, but is also extremely accurate. Having found it difficult to obtain, at a nominal price, a dividing plate with which the extreme accuracy required could be obtained, the writer developed the plate shown in the illustration.

This plate is used for accurate grinding on broaches and similar work. It can be built by a competent toolmaker in approximately 30 hours, and can be made to an accuracy of 0.0001 in. from hole to hole.

When building a plate of this type, the first thing to determine is the pitch diameter. Having determined the pitch diameter and the number of divisions, the diameter of the bushings A may easily be figured by a method similar to that outlined on the drawing.

Extreme care must be exercised in the making of the bushings. They should be made from oil hardening non-shrink steel, machine reamed and

Drawing of Dividing Plate that is both Simple and Accurate



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hand reamed to a stop on the reamer before hardening. The hole is lapped after hardening. The bushings are rough ground to approximately 0.0003-0.0005 in. over the finished dimension, then they are finish ground and lapped. Grinding must be done on the taper arbor to insure concentricity.

The shoulder disc B should be made from tool steel, hardened and ground all over. The hub diameter must be held accurately to the dimensions indicated. Cover cup C may be made from machine steel, not hardened. It is bored to allow 0.001 in. press fit over the bushings assembled on the hub of disc B. Holes in the cover plate should have clearance for the index pin D.

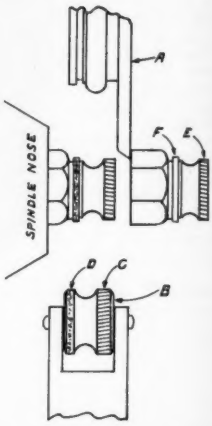
Stenciling with the Screw Machine

By D. A. Rogers

ONE of the interesting jobs that came our way recently was that of making tools for making some paper weights. The paper weights were to be made from hexagon bar stock, and each piece was to be knurled at one end and the words "University of Minnesota, College of Engineering" were to be stenciled into it at a point near the center. The job was to be done in a Cleveland automatic screw machine.

The tool combination indicated as A in the illustration was made to perform the forming and cutting off operations, and the knurling and stenciling was done with the roller tool B. The knurling tool C was of the same diameter as the stenciling tool D, and the diameter of the combined tool was the same as that of the workpiece E.

The cutting off of the finished piece and the forming of the following piece were performed by the tool A, located in the rear tool post, then the knurling and stenciling operations were performed by the tool B, which was held in the front tool post. The



Tools for forming, knurling, stenciling, and cutting off a piece made from bar stock.

machine was so timed as to allow the stenciling tool to rotate six or eight times, the knurling tool acting as a sort of geared drive for the stenciling tool.

A Simple, But Efficient, Shearing Die

By Charles H. Willey

DUE to a change in the design of one of our products, a "lock-head" screw was specified where a standard ⅜-inch round head machine screw had previously been used. The locking feature consisted of nothing more than a flat on one side of the screwhead, but it meant that we were confronted with the task of salvaging a large quantity of standard screws to make them available for use in the new design. The salvaging process entailed shearing off one side of the

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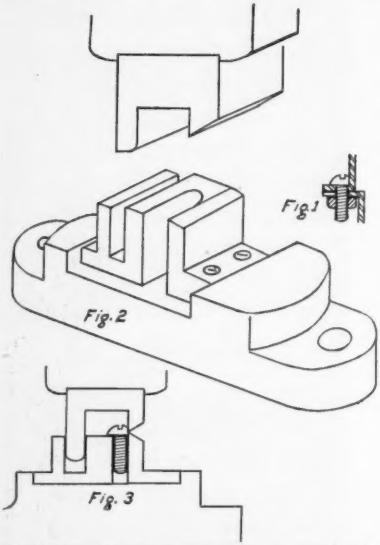
head of each screw as shown in Fig. 1 of the illustration.

The job was done very satisfactorily with the tool shown in Fig. 2. The tool is shown in action in Fig.



Tools for shearing one side of head of machine screw.

3. The lip of the punch acts as a guide to insure correct alignment of the tools so that the two cutting edges will meet evenly. The tool is set so that the cutting edges just meet at the end of the stroke, and the action consists of pinching rather than shearing. However, the screw is left with a flat, square side, and with no injury to the threads.

The tool is simple and inexpensive, and undoubtedly it could be applied to other simple jobs.

Celluloid Templets

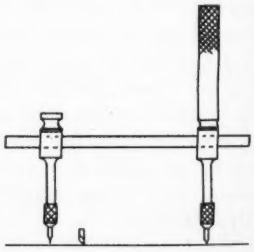
By Wm. C. Betz

TEMPLETS made of white opaque celluloid will be found useful for laying out small quantities of pieces, for drilling or laying out cam shapes or other contour work, and so on. The celluloid should be approximately ⅛ inch thick, and it is available in sheets of almost any size up to 36 inches square.

The celluloid has the advantage that it is easy to cut to shape with a knife or other sharp tool. Where circular templets are required, the material can be cut with a small sharp knife blade made from drill rod and held in the chuck of a trammel leg, as shown in the illustration. In cutting the material, it is not necessary to cut clear through; cutting half way is sufficient as the celluloid may then be broken by bending it at the cut.

The celluloid may readily be laid out with a scriber or dividers as the lines will show up clearly on the white surface. If it is desired to drill holes from the templet, small metal bushings with shoulders may be used.

Templets made from celluloid can be made at much less cost than metal templets, as the celluloid can be laid out and finished to shape much quicker and easier. It is also a fine material for use in making stencils, as it is both tough and flexible, and designs can readily be cut in it.



Blade for use with trammel for cutting celluloid templet

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Over the Editor's Desk

PLANNING is the order of the day. Industry is now planning for its future through the codes, and regardless of any changes that may occur in connection with the National administration or its policies, the codes will undoubtedly become permanent. It follows that with a minimum wage and a limit on the number of hours that a plant can operate, the wide-awake manager must plan his production and his equipment accordingly. It is becoming increasingly difficult for a manufacturer to operate in a haphazard fashion, figuring that lower wages and overtime will make possible a low selling price that will attract business. The high cost of operating with obsolete equipment and methods will become more and more apparent, and perhaps it is just as well so.

A firm manufacturing printing presses in an Eastern city decided to leave the cramped quarters in which it had existed for many years and move into a plant, then available, which was admirably suited for the purpose and which afforded room for expansion. In freeing themselves of the old buildings, the management decided to free themselves of the antiquated equipment and methods also. Consequently two-thirds of the machinery was replaced with modern equipment. According to a statement by the works manager, the plant is now producing more with 1598 machines that it formerly was able to produce with 2408 machines.

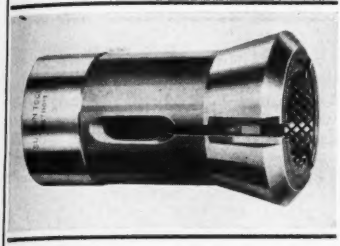
Obviously, care was exercised in the selection of the new machines. Identical machines were purchased for operations of the same general nature. Power applications, speeds, feeds, tools, and appliances were standardized. This policy permitted the setting of uniform standards of accomplishment and eliminated many of the variables which previously had been responsible for loss of production.

A Methods Division was established, and through this division the best experience and knowledge of the entire force is drawn upon in planning the operations on the various parts. When new parts are in process of design, the designing engineers work very closely with the tool engineering department to the end not only that the work may be expedited by the use of jigs, fixtures, and special tools which shall be both as efficient and as simple as possible, but also that these tools may be available as soon as the parts are received in the shop. Such equipment makes it possible to utilize all the advantages of the most recent developments in cutting tools, made available by the increased power, rigidity, and speeds of the new machines.

The contrast in the time required to produce the product, as between the old and new methods, is said by the works manager to be unbelievable. In some cases, as in the machining of large, heavy parts, the time required by the present method is less than 23 per cent of the former time, and full credit is given by the management to the new procedures, appliances, and machines.

The experience described above could be duplicated in many shops in this country. Modernization is going to become increasingly important, and the first step toward modernization is an open mind on the matter of equipment and methods. The plant owner or manager who has come to believe that his is the only business of its kind in existence and that it is immune to that form of industrial tuberculosis known as obsolescence will wake up some day to find that his business is gasping its last gasp.

Hot - Rolled Stock?



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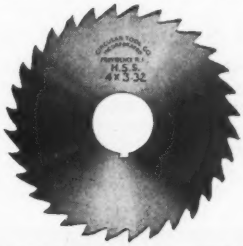

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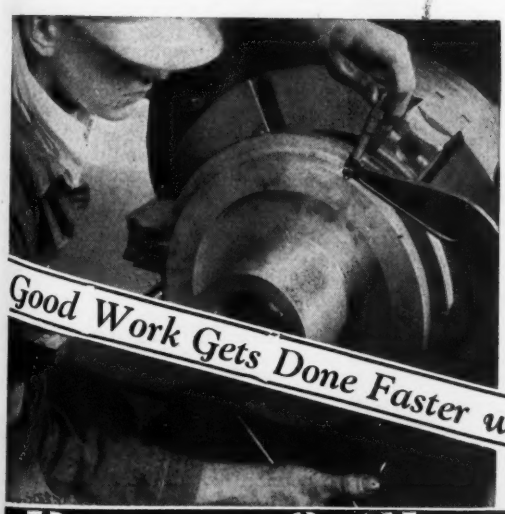

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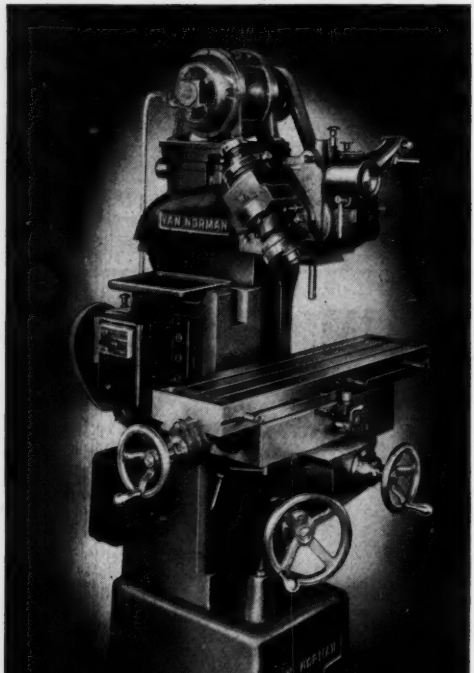
NEW SHOP EQUIPMENT

Van Norman No. 12 Miller

A number of advanced features, designed for modern tool room and pattern shop conditions, have been incorporated in the design of the No. 12 miller which has been announced by the Van Norman Machine Tool Company, Springfield, Mass. The machine retains the adjustable cutter head and movable ram typical of all Van Norman Millers. The cutter head is adjustable not only for horizontal and vertical milling, but also for angular settings over a 90-degree range. With the subhead attached to the face of the main head, almost any angular surface can be obtained through the full travel of the table, using a standard right angle cutter.



Van Norman No. 12 Miller

The saddle and table of the machine are considerably heavier than former Van Norman Millers of corresponding range. The knee is a box type and other parts have been stiffened to give the No. 12 greater rigidity than in previous machines of the same size, allowing it to handle heavier work and at higher speeds.

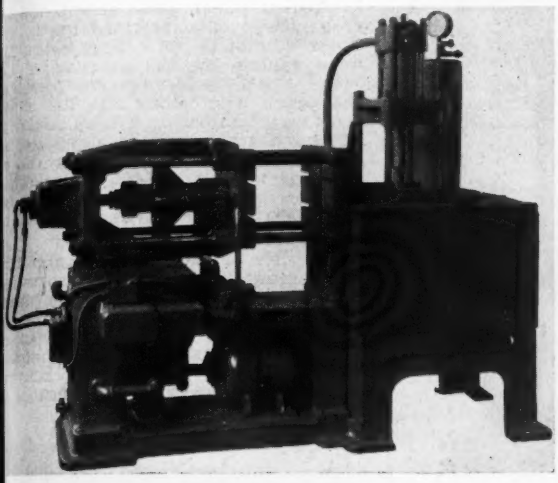
All cutter head drive gears are contained within the ram, the ram and the cutter head making up one complete unit having no drive connection with the rest of the machine. Anti-friction bearings are used throughout the machine. The standard cutter speeds range from 70 to 1465 r.p.m., and higher speeds can be obtained if desired.

A motor is mounted on the top of the ram and the drive from the motor to the cutter head drive gears is by a heavy vee belt. A separate motor mounted at the back of the machine below the feed gear box serves for the table feed.

Lester Fully Hydraulic High Speed Die Casting Machine

A fully hydraulic high speed die casting machine, to be known as the No. H-HP-1, has been announced by the Lester Engineering Company, 278 Rockefeller Bldg., Cleveland, Ohio. The machine is fully hydraulic and self-contained, reducing the installation and maintenance cost to the minimum. The pressure necessary to inject the

metal into the die is created hydraulically, thus eliminating necessity for a source of compressed air. It is stated by the manufacturer that the hydraulic



Lester Fully Hydraulic High Speed Die Casting Machine

mechanism operates with the smoothness and effectiveness which is characteristic of most modern hydraulic mechanisms. High productive speed is obtained by means of a fast moving hydraulic toggle mechanism for die movement. This device is positive acting, developing a safe locking pressure of 35 tons. This power can be utilized in pulling large cores. In conjunction with this die operating mechanism, is an automatic plunger control which eliminates all lost time between the various phases of the cycle of operation.

Since the metal to be cast is injected into the die by the solid displacement method, the quality of the finished part, in respect to solidity and surface finish, is the best obtainable. The injecting device is so constructed as to function properly for the life of the vital parts. Wear between the plunger and metal cylinder is automatically taken up and metal pressure is always maintained. Automatic plunger control leads to uniformity of results, by eliminating the human element.

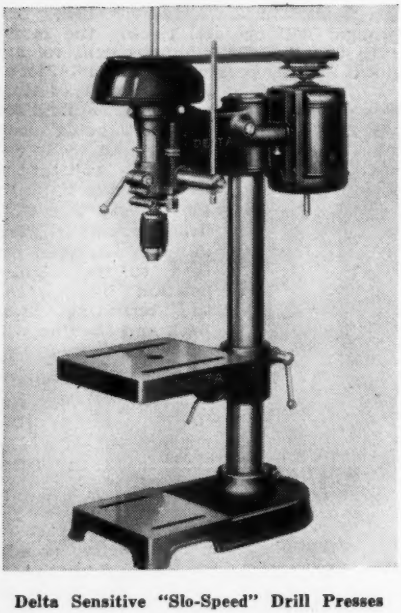
The operation of the No. H-HP-1 machine is controlled by a single lever. Pulling the lever out will close the die hydraulically. As soon as the die is completely closed and locked, the plunger will operate, forcing the metal into the die. The plunger will remain down holding pressure on the metal for as long a period of time as may be required for the part being cast. There is an easily accessible adjustment which makes it possible to vary this time delay accurately. The plunger will then return to its original position by pushing the operating lever back and the dies will again be opened.

Following are specifications of the No. H-HP-1 machine: Die opens 5 in.; Max. Die Height, 12 in.; Min. Die Height, 4 in.; Clearance between bars, 12x10 in.; Metal pot capacity (Zinc), 300 lbs.; Locking pressure on die, 35 tons; Machine weight, 3900 lbs.; Plunger capacity (Zinc), 5 lbs., Max. Speed (Operations per hr.), 600.

Delta Sensitive "Slo-Speed" Drill Presses

The Delta Manufacturing Company, of Milwaukee, Wis., has placed on the market a new line of sensitive drill presses of slower speed range than their standard line. The standard line was built with a wide range of speeds, to adapt it for both metal drilling and for a number of operations in woodworking. The success of this line led to a demand for drill presses of a lower speed range, adaptable for general toolroom and machine-shop work, and the new 14-inch "Slo-Speed" drill presses are the result.

The machines are built in floor-type, bench-type and double-spindle models, and equipped either with the company's "Delta-Grip" chuck, ½-inch capacity Jacobs chucks, or with No. 1 Morse taper spindles. They have double seal New Departure ball bearings throughout, free-floating spindle. 10x10-inch tilting, slotted tables, heavy steel columns, graduated quills with adjustable



Delta Sensitive "Slo-Speed" Drill Presses

depth pointer, positive depth stop and several other unique features. Speeds are 390, 745, 1280 and 2050 r.p.m.

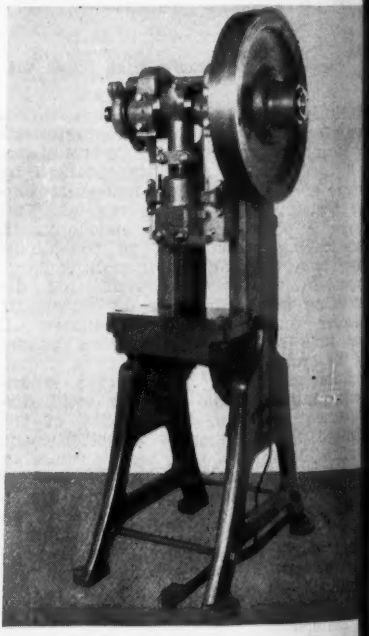
The floor type has a heavy round cast base; the bench type a cast and surfaced table-type base, and the double-spindle model a 24x34-inch base with 16½x28-inch plain table top, and 1¾-inch drain troughs all around, drilled and tapped for drain piping. Production type tables are also available for the floor and bench single-spindle models. Spindle travel on all models is 4 inches and the machine will drill to the center of a 14-inch circle.

High-speed models are also available with speeds up to 10,000 r.p.m., for small-hole drilling, and all models can be equipped with precision tapping attachments.

Federal Presses Equipped With Timken Roller Bearings

The Federal Press Co., Elkhart, Ind., has placed on the market an improved line of Federal presses equipped with Timken Roller Bearings in the flywheel of all flywheel type presses and Timken roller bearings in the back shaft bearings of all back geared presses. The application of Timken roller bearings is claimed by the Federal Press Company to be an important development in modern punch press design. The use of Timken roller bearings in the flywheel eliminates to a large extent the wear caused by the running of the heavy wheel during the rest periods of the press, lengthening the life of the press and eliminating a large proportion of clutch trouble. It is also stated by the designer that replacement cost of bearings is reduced to the minimum and necessity for turning down the crank shaft at the flywheel bearings is eliminated.

The new Federal presses also have many other improvements such as improved clamping device on the pitman for holding the adjustment of the ram adjusting screw, new style upper knock-out brackets simplifying adjustment and also a new method of locking the ball cap in place. The new method of



Federal Presses Equipped With Timken Roller Bearings

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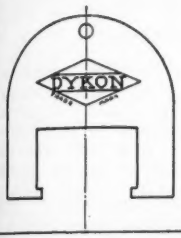

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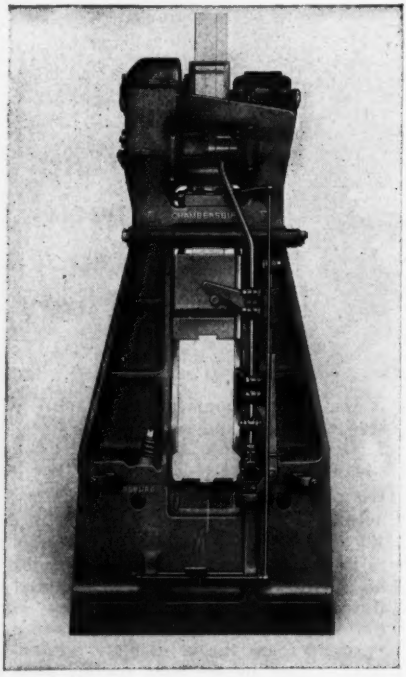
WORCESTER, MASS.

locking the ball cap in place eliminates the possibility of throwing the cap off center. The nut or cap is threaded type that screws down on the ball end of the ram adjusting screw and the new locking device is so constructed as to keep the nut central so that when it becomes necessary to adjust the nut for wear the nut is not out of round.

Chambersburg Model J Board Drop Hammer

The Model J board drop hammer, which has just been announced by Chambersburg Engineering Company of



Chambersburg Model J Board Drop Hammer

Chambersburg, Pa., incorporates a number of new features, chief of which is the use of a Nickel Molybdenum alloy for frames and anvil. This alloy, named Cecolloy, is made in Chambersburg's redesigned air furnaces and shows similar damping properties to ordinary cast iron, but with a tensile strength excess of 50,000 lbs.

A number of refinements have b incorporated in the design of the Mo J machine, among which is an extrem ly simple motor-driven head, consistin of only two main sections, which hou the eccentrics, rolls and driving mech anism, with a cap to close the ge box. The driving mechanism itself practically a spur geared reducer, th gears being of heavy pitch with wid face. Bearings are heavy duty Hya roller bearings. The motor is rigidl connected to the head and coupled the driving mechanism by a flexibl coupling.

The anvil (a Cecolloy casting) has ratio of 20-to-1 to falling weight an secures and maintains alignment b non-twisting, non-rocking frame-to-an vil connections and by the patente Chambersburg cross-guided joint. Th frames are heavy, rigid, non-rockin members of Cecolloy with integrall cast guides, the Vees being much longe and widely spaced to combat an twisting tendency.

The front rod is closer to the fra and is protected from vibration by steel-armored rubber bushing at the and by a wide-faced steel shoe p heavy padding at the bottom. A ro giving universal and quicker adju ment, replaces the usual notched r for adjusting the releasing lever po tion. Greater speed, more accurate fo ings, less down time and lower costs a claimed for this hammer.

K & T Cam Milling Attachment

Kearney & Trecker Corporation, Mi waukee, Wisconsin has developed a Ca Milling Slide for use with its Model Universal milling machines. The uni in combination with the dividing he and tailstock furnished with the ma chine, converts the standard millin machine into a highly efficient and ac curate cam miller. The unit consists a special slide and base, and a roll bracket.

Power drive for the head is obtaine from the spiral change gear unit o the end of the table. The slide mov ment is provided by pressure of th roller following the contour of the ma ter cam. A weight attached to the sli holds the roller firmly against the fa of the master cam.

The slide is arranged so the dividi head spindle may be set parallel wi

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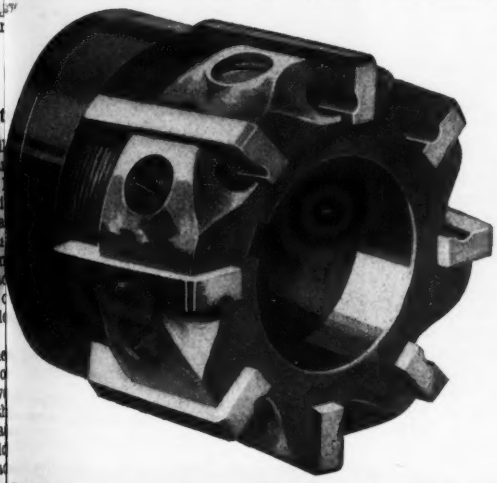

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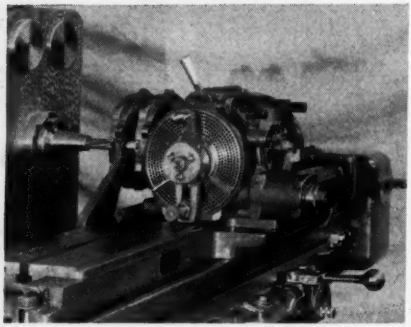
cCrosky-SUPER Adjustable Reamers

or at right angles to, the machine spindle. The dividing head spindle is set at right angles to the machine spindle for milling barrel cams, and parallel for milling face and peripheral cams. A right angle drive bracket is



K & T. Cam Milling Attachment with spindle set parallel to machine spindle for milling face and peripheral cams.

used to carry the drive from the spiral change gear unit to the head when it is set parallel to the machine spindle.

One of the features of the attachment is that in many cases one finished cam can be used as the master cam for cutting duplicates. If ten cams of a certain kind are all that will ever be used, the cost of making a master cam can be saved by using the first cam as a master and cutting nine more. No longer is it necessary to make a special cam to be used as a master. However, if duplicate cams are to be cut from time to time, it is advisable to make a master cam.

The setup for milling duplicate cams with this attachment is as follows: The attachment is placed on the milling machine table, the dividing head is placed on the slide and the shaft connected to the spiral drive unit for power drive. The master cam and blank are mounted on an arbor which is placed in the dividing head spindle. A roller suitable for the job is placed in the bracket and the proper cutter in the spindle. The slide is then adjusted so the roller is parallel to, and in the same plane with, the cutter. The feed and speed are selected and the job is ready to run.

The slide, when used on a No. 2 machine, will accommodate cams up to 10 inches in diameter and 5 inches of travel. Maximum distance betwee centers is 12 inches. The attachmen complete weighs 325 pounds.

Ex-Cell-O High Speed Milling Head

Ex-Cell-O Aircraft & Tool Corpora tion, 1220 Oakman Blvd., Detroit, Mich announces a high speed milling hea that is adapted for use on horizonta boring mills and milling machines, t provide the higher range of spee which is required for the smaller size of end mills and drills.

The illustration Fig. 1 shows an Ex Cell-O high speed milling head in stalled on a horizontal boring mill an Fig. 2 shows a close-up view of th head only. The driving shank of th head is furnished with a No. 5 Mors taper which makes it adaptable for us in all boring mills and milling ma chine spindles. The spindle in the hig speed head is furnished with a No. Morse taper which represents the mo popular size for end mills, drills, chuck and so on.

The step-up ratio of the head is fou to one over the spindle speed of th machine. The unit is designed for

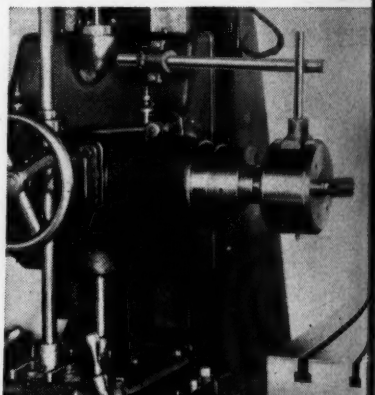
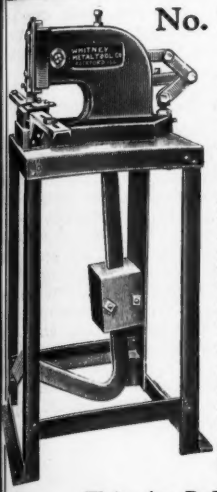


Fig. 1—Ex-Cell-O High Speed Milling Hea in spindle of horizontal boring machine.

top speed of 1500 r.p.m. on the hig speed milling spindle and has a maxi mum capacity of 1 inch diameter en mills and 1 inch diameter drills i



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Why be content with less when you can have an Ames? Write for the blue catalog with complete facts. Address Department M M. Bed 36"—Chuck capacity 5/8" or 1" Swing over bed 8 3/8" Maximum distance between centers 21"

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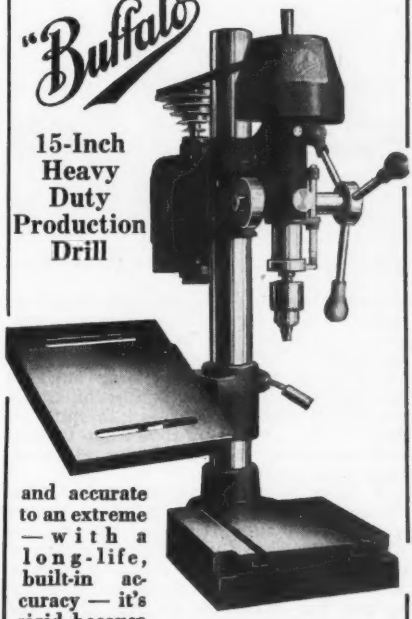

and accurate to an extreme — with a long-life, built-in accuracy — it's rigid because of the extra heavy construction. The head is equipped with double row ball bearings at top of spindle as well as two additional sets, thus assuring accuracy, rigidity and smoothness of operation. Runs smoothly at speeds to 10,000 r.p.m.

New from spindle to base—this husky, well-designed tool sells at a price which competes with many inferior tools now on the market.

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steel. The body of the milling head and the driving shank are of one-piece construction. The high speed spindle is mounted in the body of the milling head by means of precision tapered roller bearings, providing maximum accuracy and rigidity to handle the end

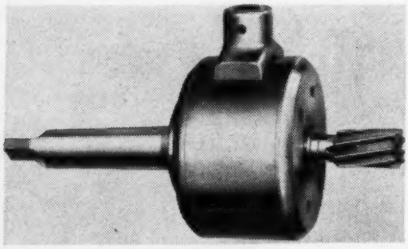


Fig. 2—Ex-Cell-O High Speed Milling Head

thrust when drilling, and side and end thrust when milling. The planet idler gears are mounted on hardened pins by means of roller bearings. These pins are securely anchored on both sides of the idler gears. A light grade of transmission grease such as used in multiple drill heads is used in this head to provide adequate lubrication for all bearings and gears.

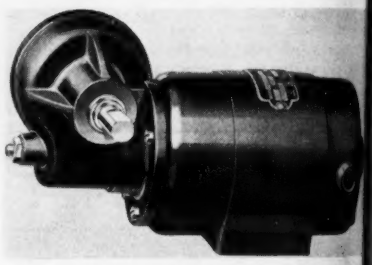
A boss is provided on the outside diameter of the milling head, as shown in Fig. 2, supporting a torque bar which engages with another bar mounted on the column of the machine parallel to the axis of the machine spindle. The torque bar attached to the head and the clamp for mounting the parallel bar are furnished with the head. The parallel bar is provided by the customer to meet the requirements of the individual job.

A knockout pin for drifting the end mills and other tools from the high speed spindle extends through the driving shank so that the tools can be easily removed without removing the milling head from the machine spindle.

Dumore Type K3-M Motor With Built-In Speed Reducer

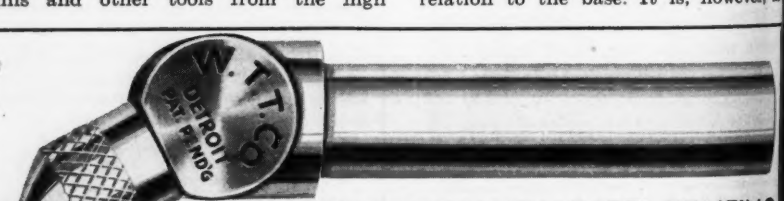
The Dumore Company, 28 16th St. Racine, Wis., announces a motor with built-in speed reducer, to be known as the Type K3-M. This equipment comprises a Dumore 1/7 H. P. motor equipped with a sturdy single gear reduction unit, capable of carrying the full power of the motor. The motor is of the universal type, operating on either direct or alternating current.

Three gear ratios can be supplied from stock—5:1, 14½:1, and 34:1, giving shaft speeds of 1300, 448 and 19 r.p.m., respecively. The grease type gear housing forms an integral part of



Dumore Type K3-M Motor With Built-In Speed Reducer

the motor frame. The illustration shows the standard mounting, but when required, the gear unit can be positioned on the motor case so that the gear shaft projects at any desired angle in relation to the base. It is, however, al-



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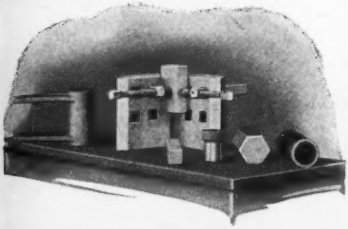

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THIS block will hold various shapes and eliminate many special jigs. It can be used to advantage on the shaper, grinder, lathe, milling machine, engraving machine and for quick squaring and clamping, laying out work, etc.

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Are especially desirable for producing clean cut, accurate parts with compound dies. For after operations, swaging, piercing, trimming, etc., the overhang type is preferred. We have had a long experience in making such dies. Please send us samples or drawings for estimate.

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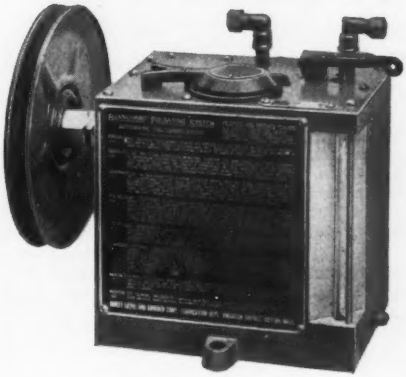

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One Pumping Unit Can Supply 100 Bearings
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Faneuil, Brighton, Mass., U. S. A.

ways at right angles to the armature shaft.

The gear unit is fitted with a single ball thrust bearing to take the thrust of the worm. The reverse direction of rotation can be taken care of by fitting the motor with a ball thrust bearing at the end opposite the gear unit.

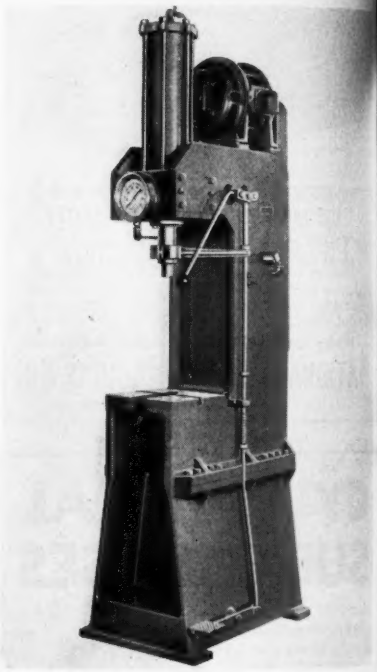
The motor has a forced air ventilating system making it suitable for continuous duty. Complete with gear unit, the motor weighs only 7½ pounds.

"Logan" All-Steel Electric Welded Hydraulic Forcing Press

A new line of all-steel electric welded hydraulic forcing and broaching presses, in sizes from ½ ton to 50 ton capacity, has been brought out by the Logansport Machine Company, Logansport, Ind. The small presses up to 5 ton capacity can be furnished for bench mounting.

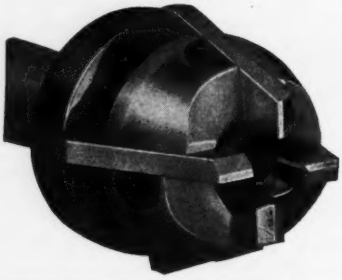
The oil reservoir for the hydraulic circuit is in the column of the press. The oil pump, valves, etc. are mounted on a panel attached to the column and are within the oil reservoir. The pump is chain driven by a motor mounted on top of the column of the machine.

The hydraulic control valve is foot or hand operated. When the operator steps on the foot pedal or pulls down the hand lever the ram makes its down travel. Automatic or manual reverse of ram is provided. Reverse of the ram can be made at any point of down stroke. When the ram reaches top position the pump bypasses and does not work against pressure.



"Logan" All-Steel Electric Welded Hydraulic Forcing Press

A stop rod is arranged on the side of the press with adjustable stops for regulating length of down travel and stop position of the ram at top of stroke. Coolant pump and pan can be provided for the press when used for broaching operations. Tables of various heights and designs can be furnished to suit special requirements. Hydraulic or air operated work holding fixtures will be designed to suit the job and furnished with press when desired.



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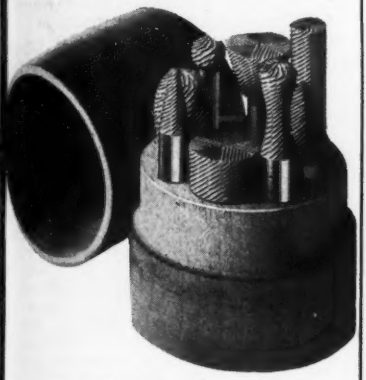

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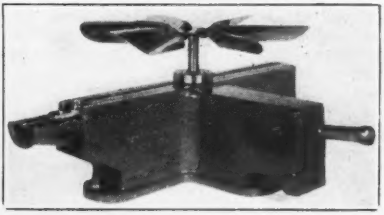

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Will balance fans as small as 3" dia. and as light as a few ounces. Also used for clutches, flywheels, pulleys, grinding wheels, auto-wheels, etc. Simplest balancer built, takes any size or shape without set-up change. A drill press hand can operate it. Very fast. *Send your blue prints for complete details.*

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Arnold Automatic

Type "C"

THIS gauge is equipped with two dial indicators—one graduated .001" and the other, .0001".

The Type "C" can be equipped with attachments for gauging width between shoulder and tapered diameters. Standard gauges measure from ⅛" to 8" diameters.

Special adaptations can be furnished for this gauge in order to handle intricate grinding problems.

This and other new FEDERAL PRECISION MEASURING INSTRUMENTS are described in detail in the New Federal catalog. Write for a copy.

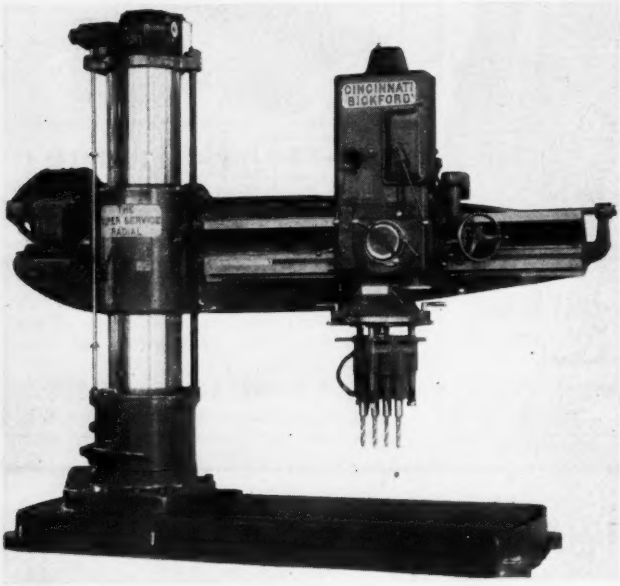
FEDERAL PRODUCTS CORP.

Providence, Rhode Island

Multiple Spindle Heads on Cincinnati Bickford Radial Drills

The use of multiple spindle drill heads on radial drilling machines has been made practical and efficient by recent developments of the Cincinnati Bickford Tool Company, Cincinnati, Ohio. As shown in the illustration, a self-counterbalancing mounting bracket has been perfected which provides rigid support, compensates for the weight of the drill head, and causes its quick return fr the work. The multiple head and mou ing bracket may easily and quickly removed, thus converting the machine a standard single spindle machine.

The illustration shows a 6-ft. Cinci nati Bickford "Super Service" Radial Dr equipped with fixed center, b bearing drill head carry three 1¼-i drills spaced on 2½ in. centers, ea spindle having ve tical adjustme Cutting lubricant supplied to ea drill by separa nozzles. Removal the drill head a mounting brack converts the machi to a standard radi drill.

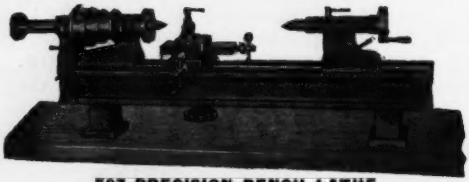


Cincinnati Bickford "Super Service" Radial Drilling Machine equipped with Multiple Spindle Drilling Head.

The drill he shown has the spi dles in line, b other types of dr heads are equally a plicable. Bolt ci cle drilling of se eral diameters is b ing handled on Super Service radi with an adjustab center distance dr head. The use of multiple spindle dr head is said to cau no loss in drillin efficiency or in ea of operation of th machine.

With multiple drill heads on radi drills, bolt circles can be drilled in wor that is too large for the single spindl upright drill.

RIVETT VALUE AT A "LOW PRICE"



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¾ in. Collet Capacity, 8 in. Swing
20 in. Between Centers—38 in. Bed

PRICES

Lathe with bronze headstock bearings	$160.00
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Lathe with ball bearing headstock	195.00
Collets—set of 12—1/16" to ¾" by 16ths	38.00
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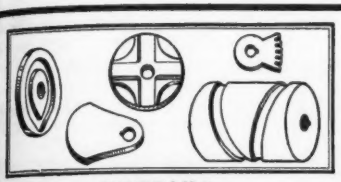
Lever chuck closer (plain bearing head)	23.00

Bulletin 507-B and Complete Price Lis
RIVETT LATHE & GRINDER CORP.
Brighton, Boston, Mass.



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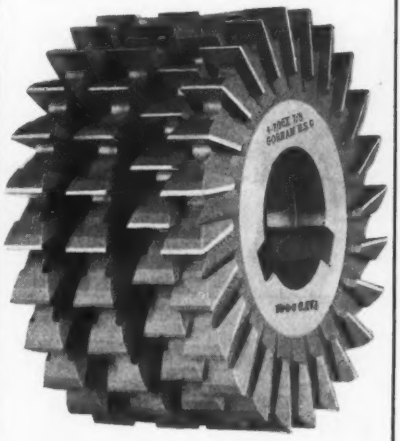

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Real Advantages in GORHAM Wiard Type Interlocking Cutters

GORHAM Wiard Type cutters have many advantages over any other type of Interlocking Cutter. They may be used singly as an ordinary side milling cutter or in pairs for straddle milling. This is possible since the double keyways are so arranged that they may be matched with the teeth in line or staggered to interlock. When used as Interlocking Cutters, they can be reversed from one side to the other giving double life before sharpening is required. Then too, any number of cutters may be built up and interlocked to any width required, finishing the sides and bottom of slot at the same time.

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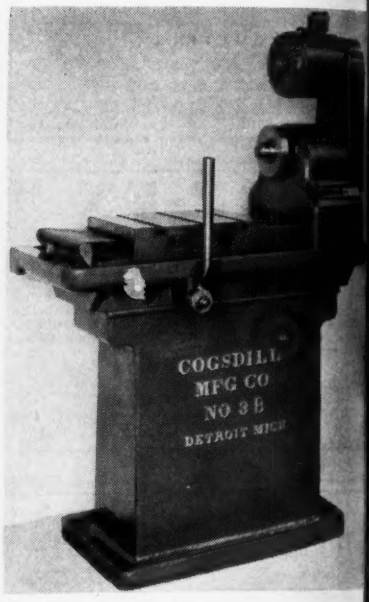
Cogsdill No. 3B Bearingizing Machine

In order to make it possible for the user of the "Bearingizing" tool (described on page 72 of the October, 1934, issue of MODERN MACHINE SHOP) to obtain the



Cogsdill No. 3B Bearingizing Machine

fullest possible benefit from the use of the tool, the Cogsdill Manufacturing Co., Inc., Detroit, Michigan, has brought out the No. 3B Bearingizing Machine shown in the illustration.

The machine is of horizontal type, con-

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ELECTRIC SAW BRAZING MACHINES, BUTT, WIRE, PORTABLE AND SPECIAL WELDERS, TIMERS AND ACCESSORIES
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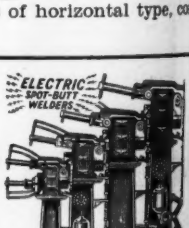
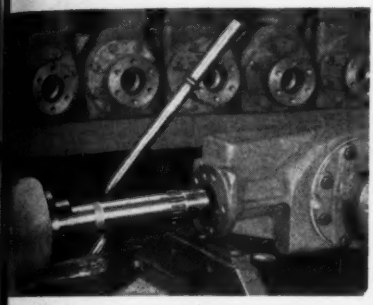


742 SOUTH 13th ST.
NEWARK, N. J.

sisting of a column, moveable table, and headstock carrying the spindle and the power unit. The table is mounted on precision "V" and flat ways and is held down with suitable gibs. Feed is transmitted from the hand lever to the table through a rack and pinion, giving a travel of 8½ inches.

The table surface is 12 inches wide by 16 inches long, and is provided with T-slots for attachment of fixtures. A roller type apron protects the outer end of



Sharingizing a 1.250 x 3½in. bore in an electric refrigerator compressor cylinder. The bore is held to a tolerance of 0.0002 in. for size, concentricity, and straightness. Time, from 7 to 10 seconds per piece.

the ways from dirt, the inner end being covered by a sheet steel guard running under the bridge-type headstock.

The spindle is of alloy steel, heat treated and mounted in precision bearings. The design of the spindle incorporates a flywheel construction that prevents torsional vibration in the driving of the tools. Drive is from a ½ to ¾ h.p. motor through a V-belt. Pulleys can be supplied for single speeds or with reversible three-step cones giving six speeds ranging from 700 to 4,500 r.p.m.

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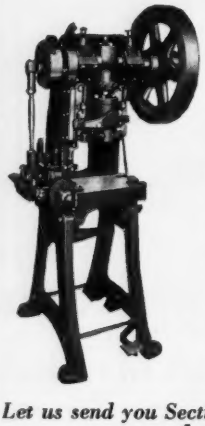
with a 1,750 r.p.m. motor. Belt adjustment is made by an eccentric mounting of the motor end bell, the rotation of which changes the center distance between the spindle and motor shaft a total of 1½ inches.

Other types of machines can be supplied ranging from a ¼-h.p. bench type without a table to special horizontal or vertical single and multi-spindle machines for high production. Combination boring and Bearingizing machines are also provided for installations requiring such construction.

Speed Up Your Punch Press Production Now



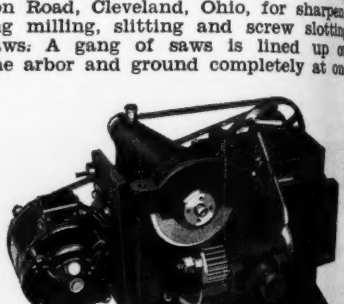
You too can speed up production and increase your safety factor immediately. Where coiled stock is utilized, feed this automatically to the press die with a Littell Style M Roll Feed. This low cost Feed is mounted on its own bracket ready to bolt to your press bolster plate.

Let us send you Section 1 which gives you details.

F. J. LITTELL MACHINE CO.
4127 RAVENSWOOD AVE.
CHICAGO, ILL.

Wardwell No. 35T Automatic Saw Grinder

The No. 35T Automatic Saw Grinder illustrated is a recent development of The Wardwell Mfg. Company, 3169 Fulton Road, Cleveland, Ohio, for sharpening milling, slitting and screw slotting saws. A gang of saws is lined up on the arbor and ground completely at one



Wardwell No. 35T Automatic Saw Grinder

setting. The machine automatically indexes a gang of saws, one row of teeth at a time, and the grinding is done with a wheel of suitable thickness and properly shaped to sharpen the tooth points and gum the throats, in one operation. It will sharpen a gang of saws within a variation of plus or minus .001-inch of exact diameter for the entire lot.

The machine is fully automatic in its operation, has a rigid and strong one-piece frame casting; all bearings are ball or bronze. The worm and gears run in heavy oil; the grinding wheel spindle is long and is unusually large and is mounted in the frame, on high quality grease-seal ball bearings, com-

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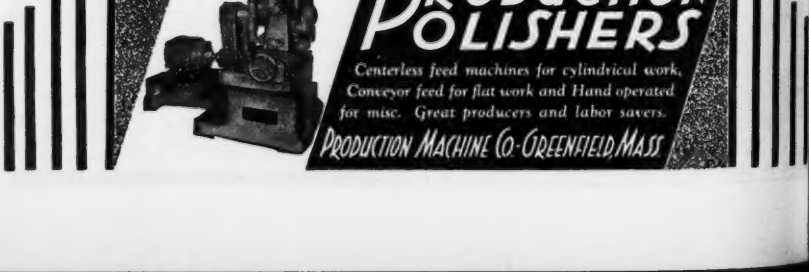
PRODUCTION POLISHERS
Centerless feed machines for cylindrical work.
Conveyor feed for flat work and Hand operated for misc. Great producers and labor savers.
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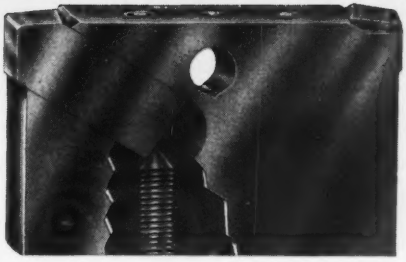
pletely protected against dust and dirt. The saw arbor is fitted to a horizontal slide, which reciprocates under the grinding wheel on dovetail slides, protected from dust and dirt and gibbed to take up wear. The saw arbor is also arranged for vertical and horizontal adjustments. The reciprocating slide is operated by an adjustable eccentric, which is adjustable for a stroke up to inches. The eccentric shaft is provided with a clutch which can be instantly thrown in or out of connection, stopping the movement of the slide, when desired in making preliminary adjustments.

A stop, or aligning gauge, is provided for quickly lining up the saw teeth when placing the saws in position for grinding, and swings down out of the way after the saws are locked on the arbor.

The saws are automatically fed, at a speed of 28 teeth per minute, by a 5-inch diameter index plate, which is fastened to the other end of the saw arbor. The feeding is entirely independent of the saws and no attention is required after the machine is once started. The feeding of the saw against the grinding wheel, also automatically feeds the face of the tooth against the side of the wheel, grinding off the face of the tooth and resulting in greater precision and accuracy of the saw.

A 6-inch diameter, 3/16-inch thick grinding wheel is employed. A diamond dresser can be furnished, which is mounted to the wheel guard. This dresser has a horizontal adjustment to the wheel and swings in line with the center of the spindle. It is also adjustable for any angle desired. The capacity of the grinder is for saws from 2 to 5½ inches in diameter, with tooth spacing up to ⅜-inch from point to point. The saw arbor has a capacity for holding saws up to 1¾-inch in thickness. The machine can be furnished either belt or motor drive.

DAVIS
BORING TOOLS



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Cutters are made of High Speed Steel, Stellite, or Tungsten Carbide tipped, ground for straight through boring, boring to a shoulder, or reaming. For special boring operations, expanding block cutters with two or more cutter arrangements for step boring can be supplied.

Write for Block Circular Giving Full Description.

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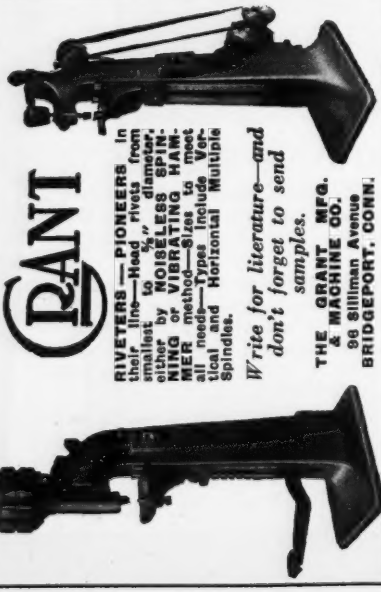
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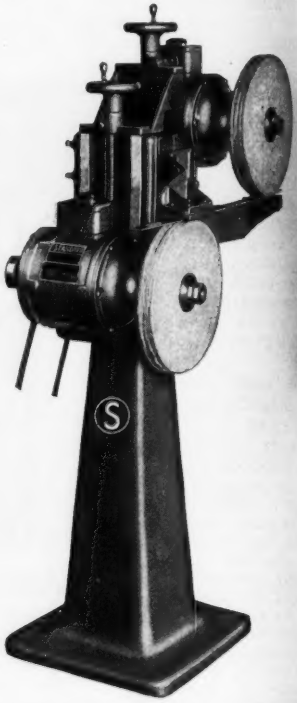
"Standard" Strip Steel Cleaning and Polishing Machine

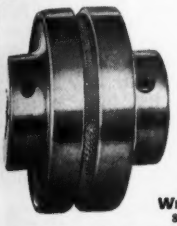
The Standard Electrical Tool Co., 1[illegible] W. 8th St., Cincinnati, Ohio, announce[s] the development of a strip steel cleaning and polishing machine. The machine [is] designed for production purposes as [it] permits cleaning and polishing both sides of strip steel in one operation in con[nection with electric hardening and tempering furnaces.



Standard Strip Steel Cleaning and Polishing Machine

The method used is to have one machine for cleaning the scale, the buffing wheels having emery glued to the face, and another machine for polishing the strip. Vertical adjustment is provided to compensate for wheel wear. A guide shoe is located at each wheel.

The machine can also be used in the same manner on wire of all sizes.



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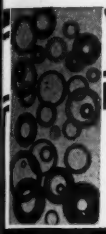

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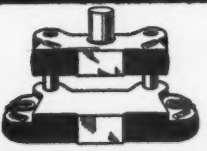

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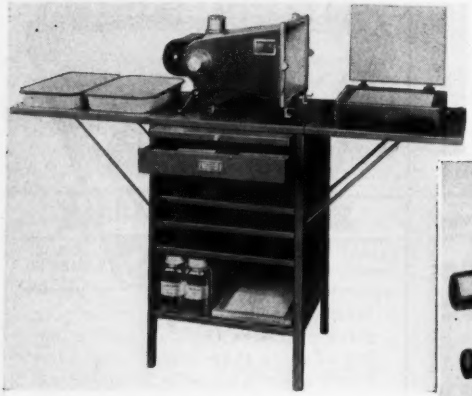
DETROIT, MICHIGAN

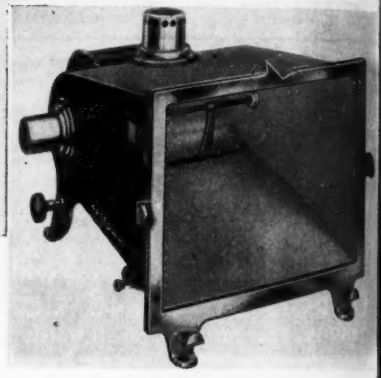
"Speedway" Blueprinter

A blueprinting machine of compact size and design with which a 9 x 12-inch blueprint can be produced in from one to two minutes without the aid of a dark room has been placed on the market by the F. A. Smith Manufacturing Co. Inc., 185 N. Water St., Rochester, N. Y.

The machine consists of an all-steel cabinet upon which is mounted a projector, as shown in the illustration. The cabinet is sturdily built and is finished in dark maroon. It is equipped with side leaves and is fitted with a twin compartment light-tight drawer for tracings and blueprint paper. A pull shelf is provided at the front.



"Speedway" Blueprinting Machine



Interior View of Projector

To make a print, the tracing and blueprint paper are placed together and inserted into the printing frame, then the frame is set into brackets on the front of the projector. The operator sets the switch timer at the proper indicator number for the amount of exposure desired and turns on the arc. When the exposure is complete, a bell rings. He then removes the print from the frame and washes it first in water and then in developer for a few seconds and the print is finished, except for drying.

Eliminate Air Loss

Air lost over a period of months through leaky valves is expensive. Nicholson Valves are made of non-corrosive metals, are soap bubble tight and remain so over periods as long as six years without maintenance of any kind. Sent on trial.

Write for Bulletins.

W. H. NICHOLSON & CO.
136 Oregon St., Wilkes-Barre, Pa.

"EDGEMONT" SERVICE TESTED **FRICTION CLUTCHES**

Expanding "Type B"

Line Shaft Clutch Pulley

For general factory use and all Friction Clutch applications where a dependable clutch is needed, at minimum cost, the Expanding "Type B" has no equal.

Write now about that clutch job, we have a type to suit any service.

The Edgemont Machine Co.
2100 HOME AVE., DAYTON, OHIO

M-D Facing Heads

With Automatic Feed

Can be attached to Column Boring Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse, feeds automatically, and covers faces 6" to 30".

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MUMMERT-DIXON CO.
120 Philadelphia St., Hanover, Pa.

CENTERLESS GRINDING

Accuracy — Prompt Service

COMMERCIAL CENTERLESS GRINDING CO.
6538 CARNEGIE AVE., CLEVELAND

Anderson Improved

Balancing Ways

No Leveling Required

A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:		
Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

Write For Full Information

Mfd. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee St., Rockford, Ill.

Right ON THE LINE

Straight lines, curved lines, angles—the Stanley Unishear will follow them all with hairline accuracy.

The fastest cutting tool to be had for cutting sheet metal or any other sheet material.

Speed—up to fifteen feet per minute
Capacity—18 U.S. gauge hot rolled steel
Weight—only 7 pounds

SPECIAL OFFER

To prove that the Stanley Unishear makes other methods of cutting sheet materials slow and old-fashioned we will arrange a demonstration to suit your convenience — at no obligation. Just say "show us" to

THE STANLEY ELECTRIC TOOL CO.
117 Elm Street, New Britain, Conn.

Descriptive catalog on request

For Reducing Costs—

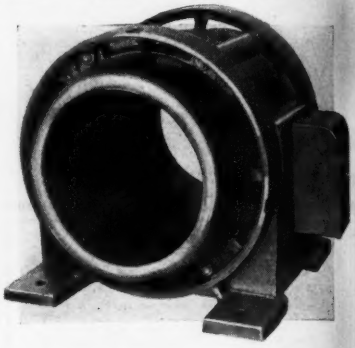
STANLEY UNISHEAR

Other Unishear models have capacities up to ¼" boiler plate

The dryer, shown on the table of the machine, consists principally of a chromium-plated platen, reinforced with heavy aluminum heat distributing plate so that it gives an even controlled heat over the entire area, producing a flat, dry print. The dryer is equipped with an illuminated current indicator with separate control switch on the side.

Allis-Chalmers "Seal-Clad" Motor

The Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has developed a "Seal-Clad" Squirrel Cage Motor which is of open type construction with permanent coil protection. Hard, smooth, Bakelite shields are sealed over the stator coils giving protection against metallic dust, grit, oil, moisture, mild acids and other agents injurious to insulation. The



Allis-Chalmers "Seal-Clad" Motor

motor is built in ratings up to 25 h.p., 1800 r.p.m., and suited to a much broader range of application than the ordinary open motor.

"Seal-Clad" motors have cast-steel frames, twistless and distortionless stators, silver-brazed, indestructible rotors, and oil and dust-tight sleeve or anti-friction bearings.

"Chicago" Universal-Type Portable Grinder

Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Illinois, announces a Portable Electric Grinder of the universal type which has a built-in air

"Chicago" Universal-Type Portable Grinder

filter, effectively filtering all air entering the motor.

The new tool weighs but four pounds, turns up 17,000 r. p. m., and has ample power to pull a wheel 2 inches in diameter. Motor housing, of heavy cast aluminum, extends out over the motor

GUARANTEED
GUSHER
PUMPS

Gusher Pumps have been thoroughly tested and indorsed by leading machine tool builders. Gusher Pumps operate with minimum friction and will serve you well.

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THE RUTHMAN MACHINERY CO.
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Precision Made Easy

COMTORPLUG
A Measuring Internal Gage
We also make measuring external Gages.
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ULTRA FLEXIBLE EASY ALIGNING
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Unique in that it operates normally with unusually large lateral and angular misalignment.

• QUIET •

Easy to install. Designed for large misalignments reducing cost of fitting, assembling, and servicing. Ideal for modern cushion or rubber mounted motors. Not affected by oil or dirt.

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FOR ECONOMY

All types for dressing grinding wheels. Shaped Diamond Tools, etc. Large stock unset stones on hand. Resetting and resharpenings returned same day received.

Send for price list and specify your requirements.

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Special Bearings Made to Order.
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Reduce Your Pattern and Die Costs
—With the Dumore Flexible Shaft Utility Tool

With this highly efficient tool many shops have reduced their pattern and die costs. High speeds for grinding wheels or low speeds for burrs are secured by driving direct from the armature or from the gear shaft. Ball bearing handpiece remains cool under continuous duty.

Those difficult, hard-to-get-at jobs are easily handled with this tool. Write for details.

THE DUMORE COMPANY
28 Sixteenth Street Racine, Wisconsin

DUMORE
GRINDERS

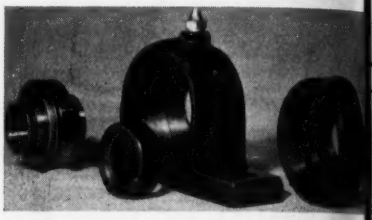
shaft and air filter, and is encased with an insulating cushion grip, giving positive control and operating flexibility. It is compact, well balanced, and, with suitable grinding wheel or cutter inserted in the universal case-hardened chuck, will work at an angle and get into and around corners, irregular shaped holes and other hard-to-reach places.

The filter is of the viscous type and can be easily removed for cleaning or re-oiling. Tests running over a period of a year in various shops have proven the air filter a most efficient protection for keeping all dust and abrasive matter out of the motor and bearings. Ventilation is in no way impaired even when the filter becomes extremely loaded with foreign matter.

Fafnir Cork-Insulated Ball Bearing Pillow Block

The Fafnir Bearing Company, New Britain, Conn., has brought out a Fafnir cork-insulated ball bearing pillow block in the design of which is incorporated a bearing of the wide inner ring type with the exclusive Fafnir Self-Locking Collar. The bearing has a deep groove, large-ball design which affords high load capacity, thrust as well as radial. The housing is typical of the Fafnir design being of cast iron with ribbed base, compactly designed so as to possess the maximum strength within its limited physical dimensions. It is prelubricated at time of assembly, assuring attention-free operation for at least a year. The lubrication is renewable by means of grease tubes as the proper fitting is included in the housing.

The insulation is a cork pad, shown in



Fafnir Cork-Insulated Ball Bearing Pillow Block

the illustration, which fits into the housing and around the bearing itself to insure silent operation. It is treated so that no separation of particles can occur. It also acts as a seal against the escape of lubricant or the entrance of dirt.

The features, briefly, of this Fafnir cork-insulated ball bearing pillow block are, compactness with ample capacity, freedom from friction, self alignment, ease of assembly, and silence.

Starrett Announces a Line of Dial Indicators

A complete line of dial indicators, designed to handle the countless measurements involved in production and inspection in the tool and machine industry, has been added to the line of precision

Ohio Gears

STOCK GEARS | SPLINED SHAFTS

SPECIAL GEARS | SPROCKETS

Write for Gear Catalog and quotation on your requirements.

THE OHIO GEAR COMPANY

1337 E. 179th St., Cleveland, Ohio

FOR EFFICIENCY—Osgood's New File Handle—Safety Filegrip

("Super-Strong" Construction)

Osgood's New Balanced-Grip File Handle—Requires 50% less tiresome gripping tension—100% Efficient—No Slippage. Furnished in either "Super-Strong" or "Junior" construction. Osgood's Safety FILEGRIP—A comfortable grip for the outer end of the file. Prevents injury. Enhances filing efficiency. Sample for a dime. Write for descriptive circular.

J. L. OSGOOD MACHINERY & TOOL CO., INC., 43 Pearl St., Buffalo, N. Y.

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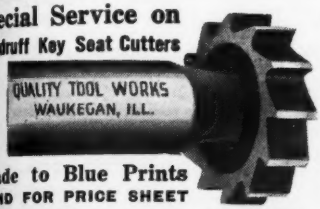

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PRECISION GAGES

In your gaging work you demand indicators capable of close accuracy, wide adaptability, and long life. That's what you get in Last Word Indicators.

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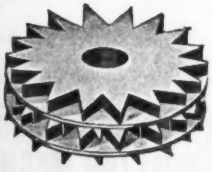
Grinding Wheel
Dressers and Cutters



We manufacture the only complete line of wheel truing tools.

Write for copy of Catalog "M" and name of your nearest dealer.

The Desmond Stephan Mfg. Co.
URBANA, OHIO

For Connecting Parallel Shafts Specify

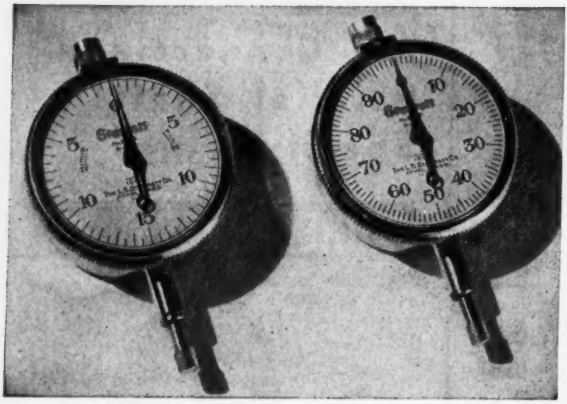
FARREL-SYKES *"The Gear With a Backbone"*

When you use Farrel-Sykes continuous tooth herringbone gears for transmitting power and transforming speed, the following advantageous features assure you of dependable, trouble-free service in every condition of service:

1. Precision generated with true involute teeth.
2. Teeth accurate in division and contour.
3. 20% to 40% more bearing surface.
4. 60% greater strength.
5. High mechanical efficiency—98.9% to 99.44%.
6. Greater load carrying capacity.
7. Suitable for higher velocities.
8. No end thrust.
9. Smoother action.
10. Quieter operation.

Farrel-Sykes Gears are available in any size from ¼ inch to 22 feet diameter. Our staff of engineers, with many years of experience in the design, manufacture and operation of gears, will gladly give you recommendations on any gear application.

FARREL-BIRMINGHAM
COMPANY, INC.
381 Vulcan Street, Buffalo, N. Y.



Starrett Dial Indicator

instruments, tools and tapes manufactured by The L. S. Starrett Co., Athol, Mass.

Several important design and construction features make these indicators exceptionally accurate and durable. Stainless steel and chromium plating are used extensively to make them completely rust proof, the gears, rack, dowels, screws, stem, bushings, etc., being stainless steel and the case and bezel chromium plated. The back is a solid die casting, recessed to hold the lug for clamping the indicator to tool spindles, machinery, production jigs or fixtures. The lug is attached on or off center as desired and can be turned parallel or at right angles to the direction of the spindle. The case is a die casting, concentrically machined, with the stem cast integral for maximum strength.

The standards used in fine watch construction are followed in manufacturing these dial indicators. Genuine sapphire jewels are used to give the gage mechanism a smooth watch-like movement. All gears and pinions are cut and finished to extreme accuracy. The hard brass nickel-plated plate to which all moving parts are attached is machined as carefully as the plate in a fine watch.

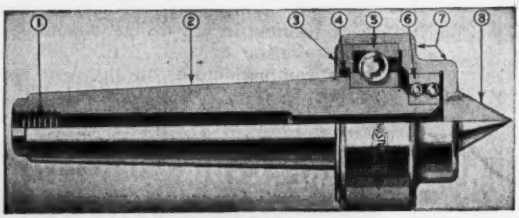
The dials are finished with a special easily cleaned enamel and are accurately marked with bold black figures against a clear white ground. The crystal is made to stand rough usage; it is thick, clear, and non-breakable.

Among the models available are indicators reading in thousandths of an inch, half-thousandths of an inch, ten-thousandths of an inch, hundredths of a millimeter and five-hundredths of a millimeter, including gages that show both plus and minus measurements. On all indicators the dial may be moved and locked to bring the zero mark to any point any point in relation to the hand by means of the knurled bezel and clamp. A catalog illustrating and describing the entire line of dial indicators is offered by the manufacturers.

"Stackrack"

The Stackbin Corporation, Providence, R. I., has added to its line of stacking devices the rack shown in the illustration. The rack, known as the "Stackrack," is a single unit rack of channel and angle steel construction, solidly welded at contacting points. In setting one rack on another to build up a section, a lip on the lower rear cross piece of the upper section hooks under

STURDIMATIC LIVE CENTER for LATHES, GRINDERS and MILLING MACHINES



It turns with the work. Eliminates friction of dead center.
Lowest possible overhang prevents vibration and chatter.

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STURDIMATIC TOOL COMPANY 5222 THIRD ST., DETROIT, MICHIGAN

GERSTNER TOOL CHESTS

Standard Equipment with all Machinists, Tool, Die and Patternmakers. Ask your Supply House. If he does not carry them, write us.

Free Catalog.

GERSTNER TOOL CHESTS
1235 Columbia St., Dayton, Ohio

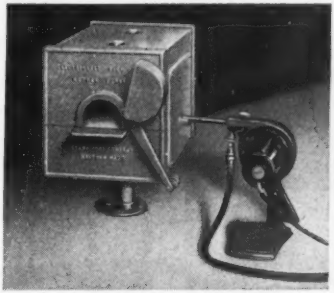
Do You Sell The New York Market?

Graduate Mechanical Engineer with wide acquaintance in this region seeks connection with manufacturer of small tools and equipment who desires Metropolitan Area representation. Replies will be treated confidentially.

Reply to:

MODERN MACHINE SHOP
285 MADISON AVE., NEW YORK

Stark
"ELECTROBLAST"



Reaches high speed heat in 20 minutes at 7c per hour. No scaling or decarburization. Muffle, 7"x3 ½"x2 ½". Burner used separately as a powerful torch. Price $70. as shown. Quickly saves its cost. Also, a larger furnace with built-in torch, muffle, 7"x4 ½"x3 ½".

STARK TOOL COMPANY
Est. 1862. *Waltham, Mass.*

Steel Tables
Large and Small

RIGID—CLEAN
FIREPROOF
DURABLE

No. 5KG HEAVY STEEL TABLE

No. 680 TABLE

No. 5KG HEAVY STEEL TABLES—144" wide by 30" deep by 30" high. Top 12 gauge steel. Frame work 1 ½" angle; legs 2" angle. Rigidly braced. Set up and crated.

No. 680 STEEL TABLE—42" wide by 26" deep by 30" high. Top 16 gauge well braced underneath. With or without drawer—bottom shelf furnished if desired. Shipped Knock Down—Saves in construction, crating, shipping weight and freight rate. Only your screw driver needed for assembling.

These tables in regular and special sizes will be quoted you promptly upon receipt of your inquiry.

Angle Steel Stool Company
"The Steel Equipment People"
PLAINWELL, MICH.

the upper rear cross piece of the lower section and a close-fitting channel at the front completes this efficient and simple lock.

The Stackrack is made to order for cardboard, fibre, wood, or steel boxes of

Stackbin "Stackrack"

any size. The size of the channels and angles is governed by the weight of the material in the boxes, which also governs the price. The rack can be used under benches, behind machines, to form auxiliary stockrooms, and in any other place where the front of the rack is accessible. The bottom box is alwa as accessible as the top one.

The welded construction provides pe manency, and the olive green baked-o enamel provides a finish that with nor mal care should last indefinitely. I querying, give outside measurements o box and approximate weight when fu

Hills-McCanna Type "SF" and "BF" Force Feed Lubricators

The illustration shows a cross sectio drawing of the Type "SF" force fee lubricator which, together with th Type "BF", have been developed by th Hills-McCanna Company, 2357 Nelso St., Chicago, Ill., to meet the needs o industry for totally enclosed mechanica lubricators. In designing these unit the single plunger principle, which ha for years characterized Hills-McCann design, has been employed.

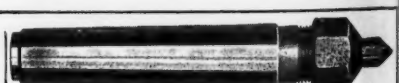
The Type "SF" lubricator has a pos tive drop sight feed built on the dis charge side of the pump. This pump i intended for service where delivery is t be checked at the pump. The Typ "BF" is built without a built-in sigh feed, this pump being intended for ser vice where delivery is to be checked i the delivery line or at the point o lubrication. Glycerine or blinker sigh feeds are recommended.

In the construction of either of thes lubricators a single plunger is employe to take oil from the reservoir, measure and force it to the delivery point. Th plunger is actuated by a rocker arm traveling on an eccentric. The rocke arm drives the plunger in a straight line, eliminating wear due to side thrust.

On the discharge stroke the oil i forced to the delivery point under pres sure and at the same time oil is drawn

Universal Nitrided Drill Bushings Wear Longer

Tool life is also increased. You get Precision and Accuracy at Low Cost. Made in the A. S. A. Standard. Interchangeable with other Standard Bushings. Optional Locks and Liners.



Universal Tool Holder Shanks

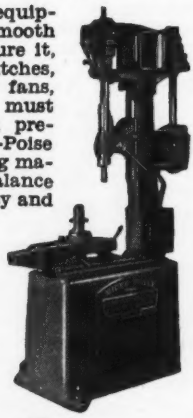
For End Mills, Drills and Center Points. Nitrided Center Points give long life without vibration.

Write for Data Sheets.

UNIVERSAL ENGINEERING CO., Frankenmuth, Michigan

BALANCE

Today's buyers of equipment demand smooth operation. To insure it, such parts as clutches, flywheels, pulleys, fans, auto wheels, etc., must be balanced with precision. The Micro-Poise Precision Balancing machine detects unbalance to extreme accuracy and measures depth to drill to correct it. It's simple, accurate, fast, efficient.

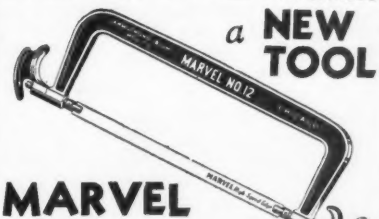


Write for complete details today.

Commerce Pattern Foundry & Machine Co.

2211 Grand River Ave., Detroit, Mich.

MARVEL *announces a* NEW TOOL



MARVEL

Heavy-Duty Hack-Saw-Frame

DISTINCTLY DIFFERENT from any frame previously made, the MARVEL Heavy-Duty is exceptionally heavy, sturdy, absolutely rigid, indestructible. Machine-type clamping blade holders. Improved, all-metal grips remove danger of injury to left thumb; make work easier, more natural. Two-handed control increases accuracy and power, maintains natural grip with blade faced in any of four positions. Hand grip below the line of blade prevents "sticking" of blade in cut and reduces tooth breakage.

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
345 N. Francisco Ave.
Chicago, U. S. A.

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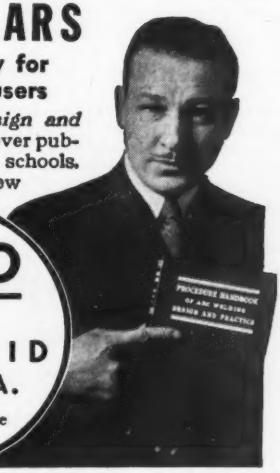
New Enlarged Edition now Ready for Engineers, Designers, and Welding users

Procedure Handbook of Arc Welding Design and Practice is the most complete book of its kind ever published. Used by many prominent engineering schools. Sale of original edition broke all records. The new enlarged edition contains nearly 500 pages of accurate data and information on arc welding, its applications and design procedure for most efficient use of the process, amply illustrated with detailed drawings and photographs.

Printed on fine paper with semi-flexible binding of simulated leather gold embossed; size 6 x 9 inches.



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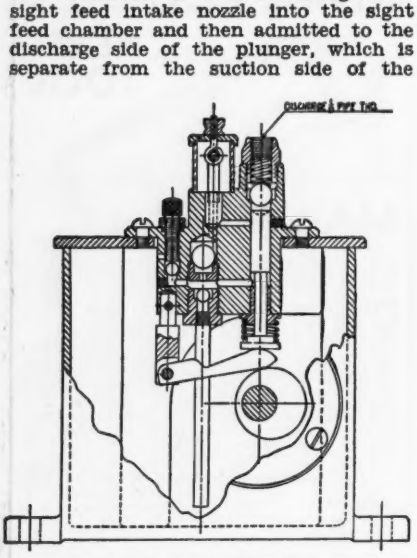
MODERN MACHINE SHOP, 704 RACE ST., CINCINNATI, OHIO

from the reservoir for the next delivery. On the down-slope, the oil in the suction chamber is forced through the sight feed intake nozzle into the sight feed chamber and then admitted to the discharge side of the plunger, which is separate from the suction side of the



Cross Section Drawing Of Hills-McCanna Type "SF" Force Feed Lubricator

pump. The exact amount of oil passed to the sight feed is delivered at each stroke. There is no possibility of the oil siphoning the line or finding its way back to the reservoir. The sight feed glass gives visible evidence of operation. Adjustment from one to ten drops at each stroke against pressures up to two thousand pounds is possible.

The pump valves are of forged bronze and operate as independent units. The valves are interchangeable. The driv arrangement operates the plunger in straight line, preventing wear on plun ger and body. Operation is silent an vibrationless. All working parts a easily accessible.

Norbide: A Norton Development

The development of the hardest materi ever produced by man, closely approach ing the diamond, has been announce by Norton Company, Worcester, Mas achusetts.. This new material, chemi cally known as boron carbide but com mercially as Norbide, is a combination o the rare metal, boron, and ordinary car bon, such as occurs in coke. The diamon is known as crystallized carbon, while th new product is a form of carbon crystal lized with boron. Norbide is so hard tha it readily scratches and cuts the harde of known synthetic materials which hav previously existed.

Norbide, which is unaffected by th strongest acids and alkalis, has com pressive strength of 260,000 pounds pe square inch, coefficient of expansion ap proximately two thirds that of steel, a little affected by temperature up to 10 degrees Centigrade (at which point th diamond burns completely), and it i lighter than aluminum.

The new material has found an im mediate use in the cutting and lappin of the new hard alloys known as cement ed tungsten carbides which have replace high grade tool steel in many industries It was not long ago that these carbide were offered as a tool material of such great synthetic hardness that it wa difficult to shape them with the ordinar abrasives. Metallurgists who have bee baffled with the great hardness of thes new tools of industry have been startle to see the ease with which they may b

Cullman Sprockets

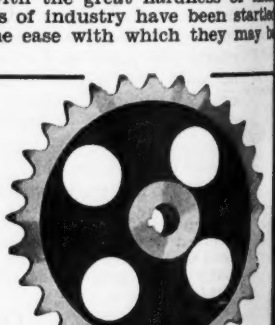
For

Roller, Block and Silent Chains

Over 45,000 in Stock

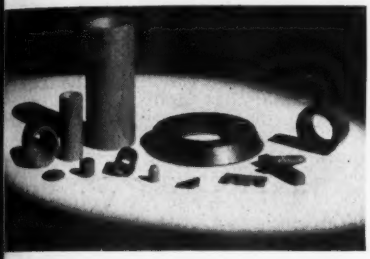
Cullman Wheel Company

1336 ALTGELD ST. CHICAGO



scratched and marked with the new synthetic abrasive which has been developed to use in this field.

Because of the high intrinsic hardness of the product, its application to uses where gem materials have formerly been necessary was immediatly tried. In this field many successful uses have been uncovered. For the drawing of fine wires of all kinds it has formerly been economic to use large diamonds which have been carefully drilled to reduce wire of a definite size by drawing through the opening of metal bars a slightly larger



Moulded Boron Carbide, known as Norbide

size and reducing successfully the size of the metal rod until it is sometimes made so small that it is finer than the most delicate human hair. This application has been made of the new carbide and its use has been extended.

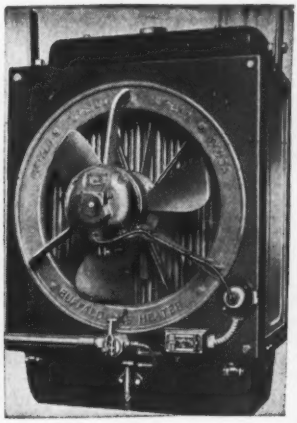
Wear resistant bearings of all kinds have been manufactured of the new product suitable for inclusion in such widely different uses as electric meters and high speed rotating spindles on grinding machines. Here the high polish and hardness of Norbide approaches that obtainable with the highest grade industrial diamonds. In a certain sense, therefore, Norbide is a substantial attainment of industrial diamonds by synthetic means.

Reed Knurls

A complete line of standard stock knurls is now being offered by Reed Small Tool Works, Worcester, Mass. The knurls are made in a variety of types and designs, to cover a wide range of pitches and sizes of holders and pins. Diagonal face patterns are available in both right and left hand designs, and diamond patterns are available both male and female, to produce either male or female impressions. Thread knurls

Clean, Cheap, Convenient HEAT

with Buffalo GAS UNIT HEATERS



In hundreds of shops, large and small Buffalo Gas Unit Heaters have solved the heating problem. These shops now have uniform, controlled, forced circulation of warm air of the temperature desired, with automatic, money-saving controls which prevent waste of fuel.

Quickly and Cheaply Installed

Buffalo Gas Heaters require only connection to gas line, electric current and the application of a match—and they begin to HEAT! They require no fuel storage—or ash heap. They are odorless, dustless and smokeless—and no fireman or engineer is required to operate them.

Used for heating every kind of shop, store, office, garage, storage building, etc. Full approval of Fire Underwriters.

Also STEAM Units: Buffalo manufactures a complete line of floor and suspended steam unit heaters also.

Write for Bulletins: Before you buy any heating equipment send for Buffalo Bulletin No. 469 which describes the entire line. Complete ratings included.

BUFFALO FORGE CO.

388 Broadway **Buffalo, N. Y.**

In Canada: Canadian Blower & Forge Co. Ltd., Kitchener, Ont.

are available for 12, 16, 20, 25, 30, 35, 40 and 50 pitch.

The knurls are manufactured to close limits, and therefore are uniform in thickness, in diameter, and in the size of the hole. They are practically perfect as to concentricity, operating with a minimum of chatter and roughness in

Examples of Reed Knurls

the work. All knurls are made from alloy steel of the greatest attainable toughness and hardnesses, and every knurl is given a Rockwell hardness test to narrow limits. The knurling surface is highly finished after hardening, so that it will produce a like finish on the work.

All knurls are carried in stock for immediate shipment.

Houghton 600 Series Sta-Put Extreme Pressure Gear Lubricants

A series of lubricants designed to meet extreme pressure gear lubrication problems has just been announced by E. F. Houghton & Company, 240 W. Somerset St., Philadelphia, Pa., as an addition to its oils bearing the brand name of "Sta-Put". This is a viscous oil series in which is incorporated what is said to be the greatest load-carrying capacity heretofore obtained. These lubricants were produced for modern heavy duty gear lubrication, which demands high viscosity with extreme pressure characteristics.

The company states that actual tests on standard measuring machines show that Sta-Put 600 Series Extreme Pressure Gear Lubricants are capable of withstanding from 3 to 5 times the load that oils of the same type without these E. P. characteristics are capable of doing. Further, it is stated that actual torque readings prove that these lubricants will carry these loads with reduced frictional losses of as much as 30 per cent to 50 per cent as compared with the same oils before treatment. This means that bearings, gears and many other parts of high speed or heavily stressed machinery will run cooler and consume less power when the Sta-Put 600 series is used.

This range covers all of the requirements from that of light duty speed reducers to the heaviest of worm or herring bone type speed reducers operating under shock loads.

Racine Variable-Volume Hydraulic Pump

The Racine Tool and Machine Company, Racine, Wis., announces a variable-volume hydraulic pump of simplified design, improved efficiency and sensitive control. Constant pressure of 500 pounds per sq. in., with momentary pressures up to 1000 lb., are available in three sizes of pumps with volume ranges from zero to 2000, 4000 and 6000 cu. in. per min. These three sizes are furnished in one size of pump case, the variations in capacity being obtained by varying the width of pumping rotor.

Pumps are of multiple vane type, having 13 vanes, which when revolved at a constant motor speed of 1200 r.p.m., provide 15,600 impulses per minute. This speed insures very smooth operation at all pressures.

The volume is controlled from zero to

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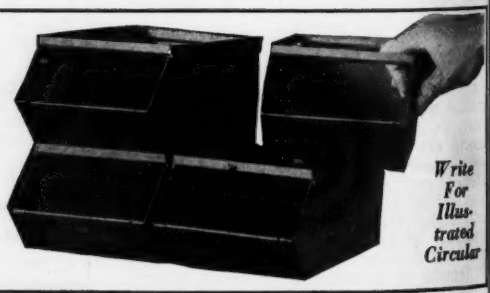
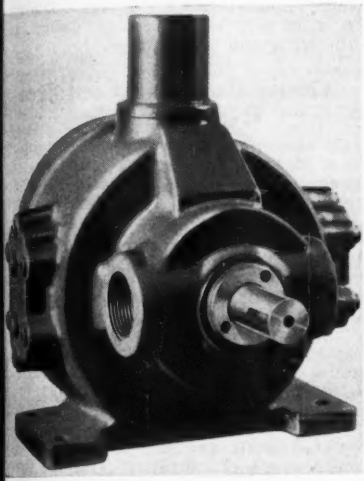
Troy St., Providence, R. I.



Write For Illustrated Circular

maximum by offsetting the governor ring or pumping chamber mechanically or automatically. Positive control of volume is provided through manual or mechanically operated control lever. Automatic control is provided by a piston type of hydraulic governor which reduces volume



Racine Variable-Volume Hydraulic Pump

automatically a sufficient amount to maintain any desired line pressure.

With this device the pump may be operated at full volume until a predetermined pressure is reached. The hydraulic governor then reduces the pumping chamber so that only sufficient oil is pumped to hold the desired line pressure. This feature has a dual purpose, in that it eliminates all by-passing of surplus oil with consequent reduction in temperature rise of the oil, and also reduces the horse power input in direct proportion to the volume of oil pumped.

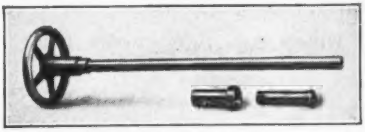
These pumps are remarkably small in size considering their capacity, making possible installation, as built-in units, without the necessity of mounting independently. The design is extremely simple, and all of these parts are hardened and ground.

The design of the pump allows the rotor assembly to be carried by a solid steel shaft on which are mounted the latest type of needle-roller bearings. Due to the hardened and ground construction of all moving parts—most of which are hydraulically balanced—there is but slight possibility of wear.

The units are furnished individually or mounted on a base containing the supply of oil for the hydraulic system and providing space for direct connected electric motor.

Willson Style DC50 "Double-Duty" Safety Goggle

Welders whose duties include a certain amount of chipping, grinding, or other hammer work in connection with weld-



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Brighton Dist., Boston, Mass., U. S. A.

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No. 1 Capacity 0 thru 3/32" wire, $1.25
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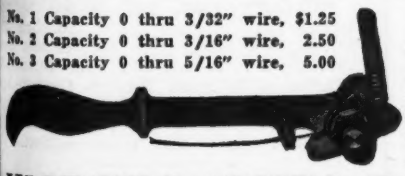

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HJORTH LATHE & TOOL CO. 12 BEACON STREET WOBURN, MASS.

ing will appreciate the value of the goggle shown in the illustration, in which the protective qualities of both the chippers' and welders' types are combined in one goggle. The goggle is made by Willson Products, Inc., Reading

Willson Style DC50 "Double Duty" Safety Goggle

Pa., and is identified as the Style DC50.

Many eyes have been destroyed because their owners took a chance rather than to lay down their tools and change goggles. The Style DC50 goggle is made with two sets of lenses: stationary 50 mm. Super-Tough lenses for protection against flying chips or broken pieces, and hinged 50 mm. Willson Weld lenses for protection against the harmful light

THE MIDGET "FIVE-IN-ONE" SLIDE RULE is a combination Mannheim, Polymetric Log-Log, Binary, Add and Subtract Slide Rule. It will instantly add, subtract, multiply and divide any combination of whole numbers, fractions, mixed numbers and decimals. Gives every root and power, also Logs, Sines and Tangents. Made of aluminum with scales on white celluloid enamel. Size 4 in. Approved and adopted by colleges. Price with instructions and Fabrikoid Case $2.00. With leather case $2.50. Sent C.O.D. if desired. Catalogue Free.

L. TAVELLA SALES CO.
29 W. Broadway, New York

days produced in welding. The hinged lenses can be raised or lowered in an instant.

The Style DC50 goggle is constructed so that it will fit equally well whether or not the wearer also wears spectacles. It has ample ventilation through indirect ports, an adjustable leather nose bridge, and elastic headband. The goggle is of simple but strong design, and will withstand hard usage.

Grease Packed in Cartridges Now Available

Greases packed in cartridge form to fit a new type of grease gun are now being sold by the Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago, Ill. The cartridging of grease is a distinct innovation. To fill the new type of grease gun the operator merely slips a factory-loaded cartridge into the barrel of the gun, which is then ready for use.

The cartridges now being made are of one-pound capacity and include several grades of lubricant. This method of handling works equally well with fluid gear lubricant or fairly stiff grease. A partially used cartridge can be quickly replaced with another cartridge of different grade of lubricant, and the lubricant in the used cartridge, being enclosed, is not wasted and does not accumulate dirt.

This new, more convenient lubrication system has been perfected during the past few years by the Lubrication Corporation, Chicago, a concern owned jointly by the Standard Oil Company of Indiana and Bendix Aviation Corporation. Each cartridge has a sliding bottom which acts as a plunger to feed the lubricant into the high pressure chamber in the nose of the gun. Although the cartridges cannot be refilled they cost only slightly more than the same amount of grease packed in ordinary containers. Cartridges of larger size may be offered in the near future.

BULLETIN NO. 113, issued by the Square D Company, 712 So. 3rd St., Milwaukee, Wis., gives full details concerning a new Solenoid Type Automatic Starter with Push Button Control and Overload Protection. Efficiency is high and maintenance cost is practically nothing. Copies free upon request.

LANDIS COLLAPSIBLE TAPS, Styles LT and LM, are fully described and illustrated in Bulletins No. G-83 and

-81. Copies of these bulletins will be nt free to mechanical executives upon equest. Address Landis Machine Co., Waynesboro, Pa.

U. S. ELECTRICAL TOOL CO. CATALOG No. 40. Catalog No. 40, issued by the United States Electrical Tool Co., 471 West 6th St., Cincinnati, Ohio, is a complete catalog of "U. S." portable electric drills, portable tappers, surface grinders, tool post grinders, angle plate grinders, horizontal center feed grinders, internal grinders, combination grinding attachments, vertical spindle grinding attachments, and their accessories. The accessories include bench drill stands and post drill brackets, rotary hack saws, wire wheels, buffing wheels, and polishing wheels designed for use with these tools.

The catalog also includes descriptions and illustrations of the other types of grinding machines made by this firm, including ball bearing bench and floor grinders, combination grinders and buffers, combination grinders and reamer drives, heavy duty snagging grinders, adjustable speed ball bearing tool grinders, disc grinders, flexible shaft machines of various kinds, rotary milling files for the flexible shaft machines, and other equipment. Copies gratis to mechanical executives.

DRIVE DATA. Actual examples of installations of the short-center, flat-belt drives—ceiling drives, vertical drives, floor drives, and special drives—made possible by the use of Rockwood Drives are shown and described in bulletins that are published at intervals by The Rockwood Manufacturing Co., Division of General Fibre Products, Inc., Indianapolis, Ind. These bulletins will be sent to any plant engineer or executive upon request.

"SHEER CUT" END MILLS. Catalog No. 2, issued by Progressive Tool and Cutter Co., 2345 Wolcott St., Ferndale, Mich., contains 26 pages of description of the various kinds of end mills manufactured by this company. The mills are made in both single-end and double-end design, with hollow-ground spiral flutes. Holders for the mills are also described and illustrated. Specifications are included, together with a table of prices. Copies of the folder free to plant executives.

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Hotel Secor

Completely Renovized and Re-equipped

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COMMONWEALTH AVE. AT KENMORE SQUARE

400 Rooms from **$3.00** Daily

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ENGLISH GRILL ROOM AND BAR

WRITE FOR HISTORICAL MAP OF BOSTON

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